

The Constitution of The Universe.

(THE THEORY OF INTERSISTENCE),

Dedicated to my Subscribers.

BY

LOUIS STROMEYER ✓

A. R. S. M.



BANGALORE:

HIGGINBOTHAMS LD., SOUTH PARADE.

1922.

PREFACE.

TO MY SUBSCRIBERS,

It may seem rather cowardly to get other people to devote their money to publishing a revolutionary theory, especially in that only last year a leading scientific paper returned an abstract sent in the form of a letter, with their compliments; but you considered I should be given a sporting chance, for which I now thank you collectively and can only hope I have not misled you in the application of your generosity.

For thirty years I had divorced myself from Science, owing to my occupation in mining in India, but just lately in work I was thrown in contact with the Indian Institute of Science. Here I had an opportunity of learning what progress Science had made during that time, and with Einstein's theory of Relativity I saw that the scientific world was still groping about in search of the Reality, and that Physics and Chemistry were still un-united. Seeing however that people were willing to conceive things they could not conceive, I thought it quite possible that they might conceive that which they never dreamt was conceivable, so I risked writing down my ideas, of college days, which others had always considered to be nonsense. The result is this book.

It is needless to tell the reader that it has been hurriedly written, this will be gathered to be so in perusal; but out of self protection I do ask the critical reader to be generous and judge the theory and its elaboration as a whole. For it must be borne in mind that I have never been given opportunities to conduct any experiments to verify my predictions. Had this been done, I have not the slightest doubt but that the construction of this book would have been put forward more lucidly and in better language. The desire to see the theory launched in my time, no doubt, precipitated matters and possibly I have rushed into print prematurely; but it is also my earnest desire to lose no time seeing that the

late theory of Relativity is about to capture the scientific world, and delay might mean that the reception of my idea would be impossible.

Out here the absence of proper scientific literature is, of course, to be deplored and the paucity of really scientific men has lessened my opportunities to directly consult scientific thought. However I have tried to interpret modern science in an honorable manner, and only by request have I included a chapter of hostile criticism of Modern Theories.

I am indebted to a few friends who have strengthened my convictions by the attention they have paid to the elaboration of the theory, and to Mr. John H. C. Kann of the Indian Institute of Science I am also indebted for supplying the new word of "Intersistence," which admirably suited its purpose; and I will add that but for his hostile criticism I might have never reached this stage.

L. S.

KOLAR GOLD FIELD,

S. INDIA.

JUNE 1, 1922.

CONTENTS.

	PAGES.
The Introduction ...	i—xii
Note on Triadism ...	xiii—xv
<hr/>	
CHAPTER I.	
Mathematical Processes ...	1—3
CHAPTER II.	
The Reality of Motion ...	4—12
CHAPTER III.	
The Fundamentals ...	13—24
CHAPTER IV.	
Form and Posture ...	25—34
CHAPTER V.	
Co-ordination ...	35—40
CHAPTER VI.	
Phases ...	41—47
CHAPTER VII.	
Modern Theories ...	48—69
CHAPTER VIII.	
Force in the Reality ...	70—82
CHAPTER IX.	
Weight and Pressure ...	83—92
CHAPTER X.	
Cohesion ...	93—106
CHAPTER XI.	
Gravity ...	107—128
CHAPTER XII.	
Transformation of Gravity ...	129—140
CHAPTER XIII.	
Radiating Energy ...	141—158
CHAPTER XIV.	
Electricity ...	159—174
CHAPTER XV.	
Magnetism ...	175—179

		PAGES.
	CHAPTER XVI.	
Induction ..	... ..	... 180—186
	CHAPTER XVII.	
Life ...	... ..	... 187—216
	CHAPTER XVIII.	
Evolution ...	... ..	... 217—226
	CHAPTER XIX.	
Predictions	... ..	... 227—235
	CHAPTER XX.	
Concluding Remarks	... ..	... 236—245
	APPENDIX.	
The Ego	... ..	... 246—255
INDEX ...	... ..	... i—xv

The Introduction.

The Goal of Science is the Reality.

Though the bye-products are put to use in the eternal war of perservation and destruction of life, it cannot be said Science works to supply these bye-products on demand; at the most it may produce these so-called bye-products in the hope, that such can be put to use in the search for the Reality.

Generally, a science is considered to be the study of the interaction of matter and energy, necessarily conditioned in space and time; thus the original sciences of Chemistry and Physics could not exclude Biology, in the wide sense, from also being treated as a science. Strictly speaking Biology is aiming at tracing out the origin of living matter by studying the interaction of matter and energy with the uptill now un-known quantity, Life; recognised as an essential factor, but never really taken into account. Scientists see now, that the chemical and physical forces must be brought into line, if the Reality underlying manifestations shall be reached; but they still omit including therein the Vital Forces. Thus the Reality, the goal of Science, is again postponed.

The mental constitution of Man demands satisfaction. It is not a question of Pleasure or Pain, but one of satiety. In fact we are constantly and wilfully destroying those great pleasures of anticipation by indulging to repletion. Thus in Science, we are endeavouring to know all, so that the desire to know more shall vanish. And it can be said, that if this Reality be reached the career of Science will cease and in its place will arise the ambition to reach an ultra reality. This we feel will be so from past experience, but such will not be Science as we know it at the present day. Man's Consciousness, erroneously so often confounded with our mental activity, lies beyond infinite space and time and not within these realities, in so far that we conceive them as realities.

Consciousness is passive it has to take what is given it, and when the goal of Science is reached it will take no more from that quarter. To know all is complete satisfaction and it is the activity of Man in the Universe that is impressing Consciousness to repletion.

This is the nature of man's mind and it stands to reason, unless Consciousness is equipped to be impressed it cannot be impressed. Unless we are conscious of infinite things the mind would be unable to impress consciousness with finite things. This means, for instance, that unless we are conscious of quantity we could not conceive any definite quantity. If there is no sea, there can be no fish. And thus with the ideas of good and bad, right or wrong, beautiful and ugly, and so forth. When we say a thing is beautiful; there is room in consciousness for things more beautiful; indicating Consciousness is, as it were, infinitely avaricious. But as it projects the beautiful in one direction ugliness recedes from it; the mean is indifference. And so with quantity, anything is greater, less, or equal to another thing. The two ends of a line are different, they do not coincide, the middle is the third view of a line. There is no fourth idea of quantity and the mind has no means of proving such axioms; any finite quantity impressed on consciousness by man's activity is put in the balance that no man has constructed.

Science absolutely relies on this balance; and when one thing equals another thing, both together are twice as great as each other. But Algebra says differently; for when it gives the equation $a=a$ where the two quantities are in balance, it tells us that when both equal quantities are placed on one side, they neutralize each other and the equation stands as $a-a=0$. But algebra is only one of the languages used in science, it is not a science itself; yet it can mislead us as any other language can, and we must be careful in its use, as will be seen later on.

In trying to reach the Reality, Science recognises that out of the complex of manifestations simplicity will prevail and all seeming chaos will be in reality uniformity.

With matter they expect to lay hold of the ultimate unit of composition of definite form and substance, but with Energy they are still undecided, in that in one way energy is looked upon as something not occupying space and in another way energy is treated as units possessing mass, hence substance occupying space. A third party are desirous of expressing matter and energy in terms of electro-magnetic units. The result is that the laws of interaction of matter and energy are inconsistent; and though this is recognized, it is only in the last few years that an attempt has been made to remedy this. But the whole inconsistency has not been squarely faced. The accommodating spirit or responsive nature of Life has been conveniently left out even in the latest theory of the constitution of the universe. And no indication is even given as to how a living organism is equipped with that constant supply of energy enabling it to perform the work it does. The omission is not excusable: the activity and independency of Life are staring us in the face at all times.

And when we glance through modern theories, which seem to grow in number with discoveries of new phenomena, incoherence is our reward; there is no proper correlation. Physics and chemistry should by now have amalgamated into at least one great department dealing in the constitution of the universe; but they have not and the reason for this failure is to be found in this book.

If the reader will agree with me that consciousness is passive and can be clearly separated from all mental activity, an advance can be made. Consciousness thus can be considered to contain the universe, which for the moment we will consider to consist of three realities, space, time and substance. Consciousness in that case is neither composed of substance nor does it exist in space or persist in time. In saying we are conscious of the past we introduce the idea of memory an active mental state; we could as well say we are conscious of the future, which is imagination; but we can say we are conscious of the present in that the present is a middle of

no dimensions. Thus to say we are conscious of the past is merely stating we are conscious of the idea of memory which is part of the universe. Similarly imagination is also active mentality a part of the universe of which we are conscious.

The fact that statics is knowledge of substance in space freed from the idea of time, shews us that consciousness need not be always impressed by the three realities contained by it. Dynamics is knowledge of the three realities, as it were, in interaction. Music appears to get on very well with time alone, since space and substance have no significance. Geometry deals with space alone and mathematics appears to isolate substance from all space and time, in that case substance and quantity appear virtually the same, and finally we get the combination of Space and Time which is kinetics, the study of motion. Since these realities apparently can be isolated so far as consciousness is concerned, people have considered we can be conscious of separate worlds, that is we appear to be able to live in these worlds. A conception of the mind in this way becomes a possible condition of consciousness and any possible condition allows of a conception in that direction. And for these reasons apparently the human mind has from time immemorial considered creation and annihilation as possible. Time for a statical conception was not wanted; Music as known to composers had neither substance nor space, the idea lived in a flood of time; thus some realities were annihilated so far as consciousness of the universe was concerned.

As the conditions have been set forth and not needing to enter into the ultra-reality of consciousness we can fill our universe with the realities of Space, Time and Substance to infinity. If we can destroy one, in our conception of the other two, as in statics, it cannot be said it is retained in the consciousness of the universe. What this annihilation means in the ultra reality cannot be said, but we assume it is possible, for it is a fact. And if we can annihilate one of the three realities, we can and

must conceive its re-institution in the universe as possible when our consciousness turns from Statics to Dynamics. If we do not go in for complete annihilation we finite the infinite, and this is what is an undoubted condition of Consciousness, which leads to the idea that the qualities of Space, Time and Substance are variable. A vacuum is a condition in consciousness that substance does not then or there occupy space, but this can only be brought about by other substance occupying space: in that case the interaction of substance is a condition of the universe, the substance removed from the vacuum still lies in the universe. Seeing that any one of the three realities of the universe can be removed in that we are no longer conscious of any particular one of them, it is possible to think the nature of the ultra reality allows of this abstraction or annihilation.

This is an easier explanation than the assumption that we can be or are conscious of other worlds, all we have to do is to think as man has thought in ages past, that in the ultra-reality we have not only our consciousness, but a Power or Ultra-Reality which by interaction with our consciousness and the Universe enables us to see the foundation of the Reality of our Universe.

In this way I hold it is possible to conceive that the nature of Substance is interistence, a new word adopted to express appearance in the universe and total disappearance therefrom; to be in conformity with the appearance and disappearance of Space and Time in our conceptions as illustrated above.

So if we reduce our substance to units possessing volume and form, it can be seen that each must occupy a certain position of space, and if the units interist this means they are in existence at certain periods of time. If a unit persisted in time continuously for all time, then comparably it could be said a unit would occupy infinite space; the latter is objectionable, so that continuous persistence in time to be congruous with the space conception must be ruled out.

A unit volume in this way is comparable to a unit

period of persistence. Put more briefly Persistence is to Time as volume is to space. Neither units are infinities.

The recognition of all this is very important for conceiving the nature of Intersistence. If space is placed on the same footing as time, a period of time is easily seen to be in correspondence with a volume in space; and there is absolutely no reason, why if substance can occupy space it should not also exist in time. The point is however that we are not conscious of infinite Space being occupied by infinite substance, if so there is no warrant to believe that substance exists in time permanently.

We can now call substance, occupying various positional volumes of space, Matter or Energy; in that both undoubtedly move through or better put occupy different positions of space. In the same way substance existing for various periods of time is also Matter and Energy, in that both undoubtedly persist in time, which is comparable to occupying different positions in Space.

This matter should be clear proof that the units of matter and energy in nature intersist; that is they appear for a definite period and in continuation suffer disappearance also for a definite period. For convenience of thought, until properly disposed of, a spacial unit includes the unit of matter or energy in meaning.

The reader must realize, that this intersistence is going on extremely rapidly, and since every particle of matter visible to even the aided eye is composed of a number of these units, possibly all of different intersistent frequencies, it is not necessary to picture a body appearing and disappearing in a wholesale manner. Nor must the reader expect the state of appearance or disappearance takes place gradually, the nature of this is instantaneous.

No attempt is made in this book to give either dimensions to the form of any spacial unit or even to suggest an approximation of the intersistent period. The atom of the chemist must be built up out of these units in time, just as has been the case in chemistry where

experiments with the x-rays are conducing to a hypothetical structure of the atom. Therefore only on deeper elaboration can results in this direction be expected.

The nature of any matter or any form of energy manifested to us in the Reality lies in the phases of the intersisting units. This makes out that energy and matter in the ultimate are composed of the ultimate units, which exist in discrete forms and of unchangeable volume composed of the same substance; whatever this may be. So far as the elaboration has been carried out in this book, there is much to favour the belief that this ultimate unit is the essence of gravity, and that all matter and energy have been derived from what may be termed gravity units; forming the general conclusion, put in modern physical terms, that a gravitational field is the source of every thing; that is without such a field there would neither be heat electricity, nor life.

Clearly if these ultimate gravity units go to form everything they must be the smallest units in existence and by keeping units to the rectilinear form we are able to add by juxtaposition; which cannot be as completely and systematically done, were the units spheres.

The marked difference between energy and matter is explained in that it is assumed that the units of gravity and the units of all other forms of energy are identical; the difference of the natures lying entirely in their phases of intersistence. With matter composed, of what may be termed, dense units, we will have the same ultimate gravity units intersisting in correlation to each other. Thus energy is a single unit and matter is a multiple unit, which becomes probably the atom, molecule and so forth. But I do not propose to use these terms in this theory at present.

This is not a wild statement for we know that latterly the alpha corpuscles of radio-activity are now being identified with Helium, an element; and therefore matter. Which amounts to indentifying in nature a form of energy with kinetic energy. This our theory has no difficulty in doing, seeing that the substance of energy

is the same as that of matter.

If the foregoing has been carefully read, it will be gathered that intersistence denies motion to the universe. Motion as manifested to us is in the reality the reappearance of a unit in a new position. This will be dealt with in an early chapter in that the analysis of motion really establishes this theory of intersistence.

By taking away motion, that is not admitting it into the Reality, it would be supposed by physicists that Force must disappear likewise. This is not so, Force in the Reality is the insistance of any unit to intersist; which amounts to saying insistance of re-appearance is Force. Inertia, which has baffled physicists so long, thereby obtains a meaning. To intersist in one position is Inertia of Rest. As with motion, Force receives considerable attention subsequently. But it is worthy of note that by these means we get rid of the objectionable idea of Potential and Kinetic Force of Physics.

Work Done in this theory is not Energy, with which it, correctly speaking, should never be confused. Energy is substance, it occupies space; Work Done is not substance. Briefly put here, but dealt with later on, work is done where the interference of instances of units is under constantly changing conditions.

To become quite clear as to the nature of the Reality underlying all manifestations a certain amount of recapitulation must be indulged in.

The basic principle is that the substance, which goes to form all matter and energy of the universe, otherwise called spacial matter, exists as units of definite rectilinear form and volume which intersist in space and time. Interference of the intersistence of any unit can only be brought about by the intersistence of another unit, that is when the position in space of reappearance of the first unit is occupied by another unit for the whole or part of the period of time reserved for the re-appearance of the first unit. Whether one unit by the phases of its intersistence is manifested to us as energy or matter, interference manifests itself to us as force in action;

hence deflected matter in the form of kinetic energy is the same as deflected energy, which is known erroneously to us as transformation of energy.

All manifested motion must be viewed as change of position of a unit in space ; and like unto the will of man each unit has its insistence of re-appearance. If the unit cannot re-appear where it insists, it must make its appearance in another position of space at a particular time, therefore by interference, motion and change are manifested to us. Thus it can be said each unit is endowed with a will, which exhibited is force in action. Hence in any system of units with correlated intersistence there is a united will which if exhibited by interference is the total force in physical terms. This brings Life in line with all other manifestations of this universe ; and the diversities of the manifestations, we are conscious, of, lie entirely in these units, the nature of which is intersistence.

To prove that the nature of the units must be intersistence, chief reliance is placed on the results of an analysis of motion in a succeeding chapter ; and the nature of the elementary processes of mathematics, endorse that view. And even if we turn to modern physics, though not printed in bold letters, we learn that the true conception of transformation of energies must stipulate, that on the disappearance of one form of energy, another form appears *de novo*. There is no conversion of one into the other : Kinetic energy disappears and in its place Heat makes its appearance. This theory, as the reader must now be aware, brings about transformation by adhering to the same substance with an alteration of the phases of intersistence ; a far more agreeable interpretation of transformation.

Before passing on to the establishment and elaboration of this theory it can be noted here that Science should have ere this benefited by this enunciation, which is that it is only possible to conceive something moving through space if that "something" occupies space : If then energy moves through space tied as it were to matter

which occupies space, energy must also occupy space. The only possible conclusion to be reached is, that in the Reality energy is matter or matter is energy. So that even with their conception of the nature of motion, since matter ostensibly caused motion in matter by interaction, as we see in impact and so forth, it would have become obvious that the interaction of energy with matter would also produce motion; and although moving energy as such was not perceptible to our senses the conclusion could have been easily reached that matter could deflect energy. Had this been done an emission theory would have been restarted, and anything moved would have been explained on the principle of bombardment, and the idea of a force acting at a distance would have never been entertained, and therefore gravity would never have remained the enigma that it is. Yet it must be admitted a pure emission theory gave trouble, hence such was never seriously taken up. By assuming intersistence it is now possible to picture gravity as an emission sort of business, where the action is somewhat in the nature of a bombardment allowing the falling stone to be pushed to earth, culminating in the recognition that a gravitational field in the reality is a vast store house of energy from which all other manifested forms of energy are derived.

There must be some system in all this, for the deeper manifestations are probed, the more is a Design revealed. Though Science may wax eloquent on the nature of things, the idea of a Design and hence a Designer entering into the explanations is not permitted. Why postpone the inevitable?

If our consciousness, as has been shewn in the preceding pages, is passive and contains the universe, and we may now add can appear throughout Space, Time and Substance; in that we are conscious of what we perceive as existing in space and time, since we see and even hear things where they are; surely there lies, beyond this, something that regulates the impressions of our consciousness, and as these never turn out chaotic, naturally we look to something which endows them with their orderly

and consistent nature. If not, then there is no real space, time or substance; our consciousness no longer contains them, but identifies itself with them; where the observer views a picture on which is painted everything, but such is really only a reflexion of the observer and has not existence apart as might be thought. On this idealistic basis no satisfaction can be obtained by plying the enquiry into the Reality, which does not exist.

This book is not concerned with this, and if the reader insists upon idealism as being the nature of consciousness; it is useless turning over another page. The theory deals with Space, Time and Substance as three realities contained in or by a passive consciousness, and therefore has to assume there is a Design, which is undertaken with the material and tools at its disposal. And these are Space, Time and Substance.

Seeing that Space is infinite and is by no means filled or occupied by substance, with our idea that substance does not persist in Time continuously, we can from such formulate a design, which is that it is the nature of the universe to be filled, so that substance will fully occupy infinite space and will be a continuum in infinite time. Or put in plainer words the Design apparently is to pack substance into infinite space and as time is infinite this process must not only be carried into infinite space but will take an infinite time to do. This Design is therefore endless, therefore unchangeable, which man has always suspected. Substance is therefore infinite in the ultra-reality, and the universe is continuously receiving substance which is being packed away in Space.

If that is so and substance in reality is matter and energy, we are observing an ever increasing supply.

This means that the conservation of energy and the finite quantity of matter in the universe are not the true conceptions of the Reality.

Finite quantities of energy and matter could never keep the diversifications of manifestations in a perpetual state of growth. With one unit in mathematics nothing can be done to produce a change, only by adding units is

it possible to elaborate a formula. And so with the universe additions are required to keep the manifestations ever changing. The game of chess is enabled in shewing those countless diversifications by the opposite process of subtraction and one can picture a game becoming only interesting by introducing new factors.

The truth is Science has blundered with the conception of conservation, thinking that if its finite units are innumerable, somehow or other changes could take place without ending.

Note on Triadism.

This note on numerical relationship has been entered here at the commencement of this book, not as a chapter, for strictly speaking the subject has no direct bearing on the theory. Triadism or the occurrence of relationship in triplets happens to constantly appear to be the nature of things in elaboration. It is a discovered fact for which there is no meaning, but it is worth noting.

The Hittites and some Indian Sections hold the Number Three to be sacred. With the latter, we find this to be so in the Trident Caste-mark of religious significance, and it is also to be seen in the planting or marriage of three special trees in the precincts of a Temple or Sacred Stone. The Babylonians with their Twelve Zodiacs and the Teutons with their twelve numbers possibly fixed on that number as representing the 12 knuckles of the 4 fingers of the left hand on which probably the primitive counting was performed; just as can be supposed that the Latins adopted Ten in correspondence with the 10 digits or 10 toes. But such had no scientific foundation; whereas with the Hittites and Indians, the number Three may have been adopted as a number of significance, in that they may have discovered empirically that Three lay in the nature of things apart from man's anatomy.

Possibly this theory has rediscovered this fact, and it is worth while the reader's attention to believe that after all, the number Three has some basic meaning in the Reality.

Undoubtedly the mentality of man is a form of Triadism. The mathematical equation states three terms; namely that "This-equals-That," a thing can be either this or that or be neither either, that is it can be something else.

The three dimensions of space is another instance of this triadism. And even, if we try to confound volumetric space with area or flat space, we are obliged to think of

the triangle as being the simplest area within rectilinear sides. Having straight lines to play about with, we cannot form an area finitely with less than three lines. If we try to construct a circle, which ostensibly disproves the universal nature of triadism, it is found we still want a centre and a radius to construct the circumference. A line we know by its two extremities and the middle part; we cannot even divorce three from this simple recognition.

And so with Time, without the recognition of the past and the future, a moment of no duration or present time has no real meaning.

Cause and effect, seemingly a duality, have no force in meaning unless action is implied. For if there were no action there could be no effect; and there could be no action without a cause to produce the effect.

The relationship of the sides of equilateral figures inscribed in a circle stand as $\sqrt{1} : \sqrt{2} : \sqrt{3}$ in the case of hexagon, square and triangle. The figure, the side of which stands as $\sqrt{4}$, is a square escribed and not inscribed. The side of a pentagon is an odd number lying between $\sqrt{2}$ and $\sqrt{1}$, which has therefore no bearing on this numerical relationship.

All this can be proved to be so, but there is no reason for it. Nor is there any reason why the side of an inscribed hexagon should equal the radius of that circle. It happens that it is so, and in obedience to the nature of Triadism the radius is found in the hexagon, which has Three as a factor.

If we take the three simplest solids, namely, the Tetrahedron, Cube and Octahedron, we find that though the Octahedron has eight faces it has six corners, and the cube though it has eight corners has six faces. With the Tetrahedron although we have four faces, still we must have six edges, and these are the only three symmetrically formed solids possible. With a dodecahedron the symmetry disappears.

After the third Prime number 3, the differences of all succeeding prime numbers is either 2, 4 or 6. These

three values of difference again shew the universal nature of Triadism.

Continuous motion we can only recognize as straight, gyrating as in rotation, or motion continued spirally. Vibration is not continuous motion, and therefore has no bearing on this aspect.

No wonder then, that our Universe is composed of three realities Space, Time and Substance. Even matter, as we know it unadulterated, is either a solid, liquid or gas: we have no other or fourth conception. Anyhow we have no generic term in correspondence.

If we take the male and female of the living world without offspring, sex has no significance or meaning.

Multiplication and Division entail the idea of three for there must be a number to be multiplied by another number, which gives a third number the result. Likewise with subtraction, but addition only obeys triadism, if by adding something to nothing, which is zero, we can consider this a duality, which in result becomes a process in three parts.

The balance of equality however clearly shews man's Trinity of mentality, for a quantity is greater, less or equal and no fourth conception is possible. The force of Triadism, if it is really the nature of things, will render inert the four dimensional space and terms of modern Relativity, and thus allow us to get on with the Reality or the Obvious.

Chapter I.

Mathematical Processes.

Though the product obtained by multiplication can be obtained in result by addition, it would not be correct to view the two processes in the same light. The process of addition is the first element of mathematical reasoning; the idea of subtraction could have only arisen after the creation of something:—This clearly was addition to nothing, and in the same way the multiplication process had to await something to deal with. Whereas subtraction was content with one thing, multiplication had a greater appetite, and so required two quantities. It clearly however could not start from nothing like addition; and we can include division as behaving as multiplication.

To multiply we mentally suffer a want of confidence at the on start. The product does not appear self evident from the factors as with addition. And even, if it is visualized by means of geometrical construction, neither a square becomes completed by the two factor lines, nor does the cube behave any better. The circle and sphere render the idea of multiplication in even vaguer terms.

If there is a mental process of multiplication it is unknown to man in general. He first learns his multiplication tables and then applies results automatically without any mental effort. That is if he sees 2 has to be multiplied by 3 he merely knows the product is 6. The result must be counted by addition to ascertain the truth of the rule.

Early mathematics knew not multiplication, but the process reversed in division surely must have been in adoption. In all probability doubling and halving were in adoption, but a higher degree was apparently not in early use. It is worth noting in this connection, that "part" denoting division has an exact phonetic and correspondence in meaning in India. Again in Canarese "Doppa" means great with which we can compare

the O. E. word "Dapper." Double expresses the same thing.

This seemingly impossible or unnatural process of multiplication was probably established in barter, in that whereas similar things could be added together, the mind absolutely refused to add dissimilar things together. Science of the present little dreams of the origin of this commercial artifice.

The foregoing has been more or less self evident ; and it might be added has been unnecessarily introduced. But put as it has been, it becomes evident that the four elementary processes of mathematics, as mental processes, shew marked peculiarities, which deserve more attention than simple acceptance, in that we intend using them as inferentially establishing this theory of Intersistence.

Addition is an undoubted act of creation, as subtraction is equivalent to annihilation. The former produces an increase the latter a decrease even to zero. Multiplication and Division do not behave exactly the same way ; their results are produced by inflation and deflation. Like the spheres they refuse to add to form a greater sphere, nor can subtraction in this way produce a smaller one. These figures are not suitable for building or dismantling as would be the case with figures in the form of cubes. But like with a gas something must be used to produce increase of volume, so in multiplication the inflating process cannot start with nothing. And is this not so with space ? Without substance, dimensions of space are impossible, and if we adopt the opposite process of compression, which is therefore comparable to division we can produce diminution, but can never reach zero in volume by compressing a gas.

Spheres are to cubes, or possibly to all rectilinear figures, as the processes of multiplication and division are to addition and subtraction.

That space appears to be in nature the reverse of time is seen when these two factors are considered in reference to motion or to the activity of substance in the formula, where space on time equals velocity. Space

stands in the position of multiplication as the numerator, whereas time is the divisor. If we reversed their positions the formula has no meaning. Then again time appears as the reverse of space in that the past seems more vast, indeed it can be said that if life were extended we feel we might meet the end of time. This is zero or the centre of the sphere under compression. Infinite space on the hand stands before us, since zero is our starting point. For the more we explore space the greater it is.

There is, therefore, much resemblance in nature between those two processes multiplication and division, and space and time. If we reserve them for our two realities in the universe, addition and subtraction are left for the third reality, substance. In this way the nature of substance is creation and annihilation; or put in the words of this theory substance intersists.

Now if we bear in mind, how orderly and infallibly the elements of true mathematics behave, and how their elaborations have arithmetically received universal assent, we are in a way empowered to assume, that as we, who think these things, are after all conditioned in space and time, our mental processes, like those of mathematics, indicate a correlation in nature with the Reality.

No more can be claimed than that the theory is established by inference. In the next chapter it is intended to further establish intersistence by an analysis of Motion.

Chapter II.

The Reality of Motion.

The physical sciences are based on Motion and relative Rest. Chemistry for a long time was not concerned with Motion at all; it till then dealt with a peculiar power matter possessed of intermixing to such an extent, that the original properties of the intermixing parts were seemingly lost; or, perhaps better put, the differences of each part were amalgamated to produce another manifestation of each particular property. The various properties of matter were always recognised as distinct from each other, and it was never considered in the light that different properties amalgamated to produce another distinct property. It is not necessary to discuss here the nature of these properties, but Chemistry then recognised that there was one property, weight, which was always manifested as the same before and after the intermixing.

As chemical knowledge advanced it became evident that this intermixing could conduct the same work as a stone falling in a gravitational field, and there was nothing to show that the "Something," which could produce work in the one instance should be different from the "Something," that did produce work in the other case. Hence Chemistry had to look for motion in its chemical effects. Naturally the idea of Atomic Chemistry became a working basis for the introduction of motion, which it could not detect.

So now at this date it can be said that the physical and chemical sciences are based on motion. Biological studies had ever before them spontaneous motion, so that to co-ordinate themselves, Biologists, who were then more intent on metamorphism, had to recognize motion as something fundamental in their metamorphism. Just as gravitation being constant to the Chemist and spon-

taneous movements ever being evident to the Biologist, they both neglected the significance or the proper bearing they really had. The Physicists were alone constantly engaged with motion, and thus considered motion a reality of all manifestations, and persuaded the rest of mankind to fall in with their view, which has now culminated in postulating the most nerve shattering idea that the velocity of motion in vacuum is really the only absolute factor of all manifestations remaining the same in the Reality. Matter, Space and Time, our three fundamentals, on that holding as manifested to us and as we have so far universally conceived them, are to be cruelly twisted, deformed, and probably in time will be obliterated by a man perched on a corpuscle of Light, travelling at a speed that can never be exceeded as long as Reality lasts.

This news is rather disconcerting, in that I am just about to obliterate motion from the Reality and retain it only as a manifestation. It is strange how any body can have any desire to build upon motion, which after all appears to us much like a shadow of something else. We cannot describe it, unless we bring in space and time; and even then we want something that occupied space to conceive motion.

How then is our mind going to behave if we have to form this conception from our three fundamentals with demanded acquiescence, that two of them can be deformed and the third increased or decreased in size due to the deformation of the former?

If space must be deformed it must be finite, and if finite we can honestly ask the question; as to what becomes of this absoluteness of velocity of motion, beyond the confines of this "boundless" finite space? From mathematical results we are asked to conceive a four dimensional something, when the mind can go no higher than terms in three. And for that matter, as will be seen in the course of these contents, can conceive nothing in less terms. Surely Imagination is being severely confused with our power of Conception. There is such a thing as

logical imagination which stands very high in Science, but such is never a conception as ordinarily understood.

May not these mathematical deductions be incorrect, just as would be the statement $+a = -a$, on the basis that $+a = \sqrt{a^2}$, which also equals $-a$. Is it not also possible that in these High Mathematics zero is treated as a quantity, when in the form of a factor, as, $(a-b)$. When really (a) equals (b). Further a minus quantity in algebra must be always imaginary, yet we are asked to conceive it as real.

That being so would it not be more satisfactory to admit the possibilities of pitfalls, as well as admit arithmetic is alone pure, and that the highest of higher mathematics is not; and that it is safer and therefore better to work on the obvious: For seemingly a fundamental conception should be easily assimilated. The employment of higher mathematics may be convincing to a few, who think that because they can cube a quantity which is a concept, the fourth power should likewise be such. Mathematically we can cube a cube and obtain a result but mentally we cannot conceive the result of a solid cube being multiplied by another of like dimensions. The duty of mathematics is to prove a result, it is new to me that it has an additional power of making a conception. I can conceive infinite space, but here mathematics cannot prove its reality; shall then mathematics prove that space is a "boundless" finitum?

Granted that what moves through space, must exist in space and therefore must occupy space receives universal assent, even assent from all shades of relativists and animals; we must distinguish occupied space from unoccupied space in some term not derived from space. Let it be called matter or energy, it is something more than motion, and we can conceive it as lying in a fixed position or as occupying different portions of space in time.

If energy as we conceive it moves through space and matter does likewise, unless we know the nature of the substance of each is different, we are not entitled to

differentiate between the two. So far, we only know that energy must occupy space in that it moves through space, and there is nothing to forbid it being identified with matter, for that matter. The electro-magnetic idea of mass is a step in that direction. The conversion of the alpha rays into Helium is not a proof of the electro-magnetic theory, but it empirically establishes the similarity in substance of energy and matter. This after all could have been recognized logically from our opening contention, which makes energy identical with matter in that both must occupy space, since they move through space.

And perhaps it is well to continue the argument, that if we know something does not occupy space, it cannot conceivably be moved through space. Modern physicists driven into a corner in this matter have contrived to speak, of the modifications of Aether as moving through space, thereby keeping their Aether as a rigid and immoveable plenum. But it is doubtful whether this device can be of any help, for the question will again arise as to the nature of the space through which these so-called modifications move.

For our purposes we can be quite clear that we are dealing with something occupying space which can manifest motion, and there is no doubt that we strongly realize that motion is associated with this "something," which for the present can be termed substance. But as it will be shown in the succeeding lines the reality of motion and the reality of substance can be different from their manifestations. The only point that cannot be disputed is, that substance is occupied Space.

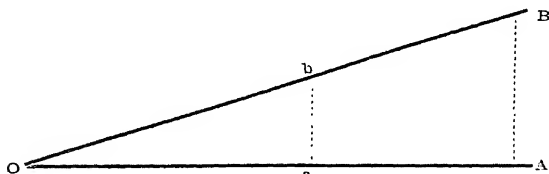
The simplest definition of motion is that a body does occupy different positions in space at different times. We are not concerned with Relativity in the absolute sense; a body is relatively at rest or in motion in respect to another body which is assumed to be at rest for the time being.

As an illustration and example, let us take an object lying at rest on a table. The reader, being satisfied with

this, can close his or her eyes during which time the body appears somewhere else on the table. On opening the eyes the conclusion is that the body has moved from a state of rest with a velocity determined by the space between the two positions divided by the time taken. Let this velocity be one foot per second. This will be admitted. And it will be admitted that the velocity is a quantity. Clearly therefore zero or no velocity at rest has been changed into a value. The body has not been changed nor the table.

To convert zero into something can only be effected by addition, and addition means bringing something new into existence. The additional quantity is a created quantity, that is it did not exist prior to the operation. Consequently we are bound to assume the body in its position of rest was destroyed in that position, or in other words was annihilated, reappearing in a new position. In this way can we conceive the reality of motion.

We can reverse the process diagrammatically.



Clearly in the above figure the space between the two straight lines OA and OB is zero; that is they intersect.

Let OA equal the one foot of space the body is supposed to have moved through in one second, which is equal to AB . If we halve the time as at ab , naturally the space supposed to have been passed through is Oa .

Now this halving can be repeated an infinite number of times, but zero can never be reached. Since any quantity no matter how minute remains always divisible. Yet we feel quite certain from the nature of the diagram

that the point of intersection O, which is zero, should be reached. Clearly after our patience has been tried for a number of times without success, the only means of reaching this zero, which we know from the diagram is attainable, is to adopt subtraction instead of division. The continuum is broken and annihilation becomes conceivable through force of circumstances.

On this the nature of intersistence is based, which is that in the reality any unit of substance, matter or energy, after appearance suffers a period of disappearance in sequence so rapidly, so that, if re-appearance takes place in a new position, motion is manifested to us.

If we take a long series of pictures and note that in each the parts are relatively fixed to each other; by passing this series through a cinetomagraph, we certainly do then see the parts sometimes in violent motion; yet at the same time we are quite certain the motion thus represented is illusory.

The disagreeable part of the business is for the reader to conceive as possible, creation and annihilation. But there are logical forces that insist upon this conception. The alternative is to admit that, somehow or other something can grow out of nothing. A cowardly admission and a contention merely postponing the inevitable. To keep unreconciled things hidden is neither science nor honesty. Biologists gloried in the infinitesimal gradations of a change conceived as a continuum of nothing to something. Physicists have practically done the same with their transformations of energy and only in very small print do they admit their conversions are really based on a conception of annihilation and novel appearance. So that although the reader may feel alarmed at this new conception, as being the basic principle of intersistence, the fact that the almighty theory of the Conservation of Energy secretly accepts the principle, will cause this alarm to disappear.

The power of conceiving creation and annihilation is in man's mind. Addition and subtraction prove such. Man's thoughts as they appear and disappear are glaring

instances of what might be termed the "Is and Is not." The tranfusion of solids virtually proves that intersistence is the ultimate nature of the Reality. The state of contact gives rise to the idea; for if a rod one foot in length is placed endwise to another rod a foot long, clearly the nature of the space between the ends is not the same as that when the two rods exist in one continuous length; and yet we say the united length in both instances is two feet. If one end of one rod is in occupation of a definite position in space, clearly the end of another rod cannot occupy the same position in space. The two equal rods would therefore measure just a little more than double their length. But they do not, therefore we have to assume that the units of the ends by their intersistence are from moment to moment overcoming this incongruity. The electrification of two rods of different metals produced by simple contact tends to prove the assertion that the space of contact is and is not, from moment to moment.

It is this non-recognition of the state of intersistence of the ultimate units that has given so much trouble. Hence Planck's breaking out from continuums into quanta and Einstein's mathematical explorations leading to space-time conceptions. The feeling was there, but neither stayed to endow the ultimate units with a nature that simple analysis of motion would have suggested.

It is assumed that the postulate concerning any thing moving through space must occupy space is true in manifestation; then the reverse must be equally true, that anything that seemingly moves through space but does not occupy space (that is has no volume) cannot be really moving through space. And if we prove there are such things that do not occupy space, though apparently moving through space, such motion must be an illusion: which means it can never find a place in the Reality.

A moving shadow presents us with an instance or for that matter any optically projected diffracted or reflected moving luminosity or picture does the same: Now a shadow necessarily is surrounded by light, take away the light and the object cannot cast a shadow.

If the screen on which the shadow falls were moved, clearly the shadow appears stationary; but if the source of light is moved the shadow clearly moves across the screen. According to the above postulate of negation, we are obliged to say, that as the shadow has no volume (that is does not occupy space) it cannot conceivably move through space. From an ordinary point of view it does. If you think that whatever you see is real and therefore give reality to that motion, it is useless continuing any discussion: but if you are open to conviction a little thought will tell you it is first necessary to know what a ray of light is. We will agree, that so far as we can be ascertained first hand, a ray of light is the thinnest possible column of something luminous. Now it stands to reason, that if the source of light is stationary, each single ray can only fall on one point of the screen, so that if we take all the points surrounding the shadow these points will coincide with the outline. Now if the source of light is moved, another series of points coinciding with the outline of the shadow are illuminated. Clearly the light does not move along the screen, which can be perhaps realized if the light is taken as stationary and the object casting the shadow is moved instead of the light. Coming to the climax, it might be held that as the source of light is really moved or the object is treated likewise, that there is evidence that both the light and the shadow do move across the screen; but this contention falls, if we arrange to move both the light and object in such a way that the shadow is stationary.

Therefore to interpret such in the reality, adhering to our former postulate that motion is inconceivable unless the object moved occupies space, we are bound to take it that the rays forming the outline of the shadow reappear in successive new positions manifesting motion.

The motion of waves of water could be analysed in the same way. The translatory motion of the waves is really an illusion. There, then again we see that motion as manifested is not a reality, and it is far better to alter our conception of motion as a continuum into discrete

appearances, so fashioned that we have thereby been deceived by our inferior powers of perception.

If the discontinuity of quantities be properly realized the reader should experience no further difficulty in conceiving intersistence to be the nature of substance.

Chapter III.

The Fundamentals.

The fundamentals are Space, Time and Spacial Matter. So far as general conceptions are concerned, we can consider occupied space, or substance, as spacial matter; such is only a condition of existence, implying therefore Time. But with spacial matter the idea of substance exists which differentiates spacial matter from space, in that we cannot associate unoccupied space with any possible idea of-substance. We might state also the conception of Time is similarly derived from the persistence of spacial matter, which also implies Space is occupied, but in no case can we express Time and Space in terms of spacial matter or substance.

It is however worth trying to view spacial matter as occupied Time, as has been done in reference to space. The idea of intersistence allows of this, in that the occupation of Time by spacial matter is momentary during the state of appearance. If spacial matter were, for arguments sake, a continuum of substance, the idea of occupation in respect of Time seems an unreasonable conception of the conditions: probably for these reasons, matter as manifested to us being a continuum has not favored the idea of matter behaving to Time, as it palpably behaves to Space. I admit that the phrase "Occupation of Time" is not good, but in its use I have trusted that the conditions of intersistence can be made to be analogous, as between Space and Time. Thus when speaking of spacial matter conditioned in Space and Time, we can view it that Persistence is analogous to Volume; and for convenience of thought it becomes possible to think and deal with Substance as persisting in Time, without reference to Space: and likewise vice versa.

We in this wise are capable of carrying the analogy further. The human mind cannot conceive two substances of similar volumes and form occupying the same space at

the same time; on the strength of the foregoing, we ought not to be able to conceive two substances existing in time (occupying time) in the same position of space; which virtually amounts in visualization to the former conditions. Tending therefore to shew there is some proof that both conceptions of negation are true; and if true there is sense in trying to conceive spacial matter occupying Time analogously as was the case with Space.

This places Time on the same footing as Space and allows of Substance being considered as different to both Space and Time; hence we derive the power of conceiving Substance in the absence of Space and Time, which in the reality means total annihilation. This total annihilation of Spacial matter implies, that consciousness of spacial matter only becomes possible when substance persists in Time and exists Space. Substance thus gets an ultra-reality during its state of annihilation, which, so far as we are concerned in this theory of intersistence, cannot be dealt with in this book. But by such it must not be taken that I am trying to prove the Indestructability of Spacial Matter, but am inclined to view Substance as having an Ultra-Reality as well as Space and Time, which I feel will be finally merged into one Ultra-Reality. Then this Ultra-Reality of Space-Time with the ultra-reality of Substance will form with something "unknown" the usual triad of entities.

I have dealt with this matter rather more deeply and remotely, than I had first intended to do, in that some of my readers might object to my limiting the Reality only so far as the triad of Space, Time and Substance is concerned; and from such they will now gather, I, like every other thinker, foresee this endless chase is not going to be terminated in this life time.

The deeper we explore Space the greater it appears to us. Thus Space is to me something emanating, as it were, from a point (myself, my consciousness) in all directions to Infinity. Graphically Space appears to be a sphere expandable to infinity from a point its centre. There is no doubt that inwardly all men conceive Space

as infinite, and only by contrivance aided by assuming inconceivable, hence impossible, conditions are there men who say Space could be limitable, but they are always very careful to avoid suggesting anything about the limitations. If Space shall be finite, then since I conceive it as Infinite my consciousness contains the Infinite Space. Only in that sense will I allow Space to be considered finite. This brings us to the Ultra-Reality and I do not intend to go further. But as there are people even at the present day, who ask one to become of no magnitude and fuss about in Flat-land with an imagination and turn up in three dimensions in order to convert the hallucinations into Common Sense, I deemed it justifiable to prepare some paper for committal to the waste paper basket in case any of my readers had undertaken the tour and had returned sane.

The man who is supposed to explore the surface of a sphere covered with a lattice work of squares, presumably is supplied with a spherical sheet of light and a suitable surveying instrument, in that case the really curved lines of the lattice work will appear to him straight. It can also be presumed that he can number the squares and can make a conjecture as to the differences^{that} would have been noticed at the poles. After having numbered all the compartments he is supposed to continue to have the belief that infinite space is really finite but boundless. During this mental operation he is virtually and gradually producing the idea of a spherical surface, which in the initial stages he considered to be a plane; that is to say, it is assumed that during the traverse of the surface of the sphere, he never had occasion to play at marbles. Man surely is constantly doing this in feeling the shape of any discrete object and boundless finiteness in this way has been termed volume or occupied space. In the same way a momentary state of consciousness is to all intents finite but boundless; memory and imagination like the outside and inside of the spherical surface, suggest unlimited Space and Time in one direction, and zero in the opposite.

As there are no co-ordinates for infinite space it is

impossible to assume there is an absolute centre; and this is so, in that if I conceive Space as emanating in all directions from a point, myself, to infinity I have the same idea forced on me at every point no matter what spatial relationship exists between the various points. The same argument applies to Time, the Future imagined is indistinct as compared to the greater Past, it seems to be getting less or converging to a point: but that whereas to know space we go outwards in all directions with time we travel from a vast past to a point corresponding with present consciousness. Thus every point in Time and Space, we have learnt is really a sphere; the inside of which is imagination of infiniteness for Time and finiteness for Space, the outside being memory of the past for Time, which is finiteness; whereas for Space it is imagination or infiniteness.

This I think is a better arrangement than viewing the matter from points on a spherical surface which only applies to space and not to time; we certainly get by our method a marked inverse correlation between Time and Space, in that the known memory of the past graphically stands inversely to the infiniteness of space as the imaginary future stands inversely to the infiniteness of space. And this could only be attained by conceiving Time in the three dimensional form as has been done with Space; so far modern representation of Time has always been of the one dimensions type, a mistaken way of viewing Time possibly due to neglecting to bear in mind that the co-ordinates of Time must be temporal and not spatial in character. Past, Present and Future are certainly three dimensions more concretely seen in cause, action and effect; absolutely comparable to the three co-ordinates of space, more concretely seen in top, sides and bottom. In both instances we get the relationship of Triadism, which as we have seen tends to assert a state of Reality exists. Neither two or one dimensional space are real, but only imaginary, thus any phenomenon, as cause and effect, without consideration of the action is imaginary. The three are always indissolubly connected together, as the three dimensions of volume will always be. A momentary action,

often termed instantaneous action, is comparable to one co-ordinate of space, being nearly reduced to zero, which is an approximate to a plane surface of no thickness.

By giving an example, this point can be made clearer. Let us take three events, a ball moving, this ball striking another ball, and the resultant motion of the two balls, which is put as cause, action and effect. The ball moving may have been moving for all time. That a ball moves, say, with a uniform motion has no real temporal meaning being comparable to a straight line in space. The ball strikes another ball this is a change of events, but we want the effect to establish the phenomenon temporally; just as with space, volume requires three dimensions. If we stop thinking at the end of the duration of the action the effect being thuswise unknown, we are in two dimensions, and insist the Reality requires a third dimension to give satisfaction. In this way temporal persistence is absolutely comparable to spatial volume. To bring about temporal persistence and spatial volume, matter cannot be excluded in either instance.

Now the idea of occupied space connotes the idea that there can also be unoccupied space, just as persistence connotes the idea of annihilation or the state of Is-not. Addition implies that subtraction is possible. If we examine the state of Action it has something definitely different in it, when compared to the moving ball, the Cause, and the resulting moving balls, the Effect. Action denies that it is either the Cause or the Effect, to me although I cannot express it, this action is comparable to the state of Is-not; that is it is not a ball moving as a cause or the balls moving as the effect, it is something between and different to both terminating events, just as the middle of a line is neither the two halves, which make the middle.

From this I would see that persistence of spacial matter is only reached in the temporal form by three events creation, annihilation and re-appearance; and that volume on the same basis implies occupation, desertion of space, and reoccupation. Thus indirectly we have

again reached our basic principle that spacial matter intersists.

It is hoped that the reader will now be able to view Time, as with Space, in the three dimensional form, by which the inverse relationship of Space and Time becomes correctly appreciated; that is we proceed from the infinite past converging to a point, whereas with space we wander further in all directions from a point. If we want finite space we have to reverse the order of investigation; that is from infinite regions we contract to form a finite sphere; with knowledge inside leaving imagination outside; on the otherhand if we want to finite Time, we expand to form a sphere with the knowledge of the past lying outside and imagination inside, which is the future.

In this way we get a sphere of time as well as a sphere of space graphically represented, and using the spherical coordinates we find that the surface of a sphere is related to the square of the radius; in this way it becomes a suggestion that vividness of memory will diminish at the rate of inverse squares of time, where spherical surfaces would increase in proportion to the factor of inverse squares. In fact this seeming inverse relationship of Time and Space may have everything to do with our mental powers of finiting everything, although we know it is impossible to divide infinite Space or Time into parts. For it must have occurred to the reader, that in considering volume as a finite portion of Space, infiniteness has no meaning. One can mentally divide a finite whole into finite parts, but there is no encouragement to do this with Infinity and Zero. If Time reacts on Space this becomes a somewhat feasible idea for explaining those incongruous conditions. The Is and Is-not seems to be the nature of our minds, hence the inevitable middle or balance in all things.

This may be of some consequence to Relativists in trying to obtain velocity by dividing spherical space by this spherical form of Time. So far they have only considered linear space and one dimensional time. I expect appalling results when Volume is divided by

Persistence. But I have no doubt mathematicians will willingly do it, and thereby possibly prove that Infinity is divisible and Zero will undergo multiplication; thus upsetting the mathematical sanction for this theory.

Spheres, as mentioned in the chapter on Mathematics, refuse to add or be subtracted like rectilinear figures, yet they can be increased or decreased in volume, naturally we turn to the mathematical processes of multiplication and division for producing such alterations; hence I recognised Space in the former, and as Time is now the converse of Space, Time appears against Division.

The result of this lengthy foregoing argument should bring it clearer to us, that there is a reason why space cannot be divided by time, and that the ordinary notion of velocity, which is dimensional motion, is really based on imaginary factors of one dimensional space and time; hence what we have already deduced by other means is also reached by taking space and time as spherical concepts; which is that motion does not and cannot belong to the Reality. I admit it will be a little difficult for the reader to appreciate this point in that motion appears as the very nature of Reality with the clearly associated Force. I also appear to be taking out all life from Nature as we know it; but if experience has taught us soap bubbles will burst in spite of all the soaps invented, we must discard soap finally, if we want our bubbles to last even if they last a year; the long cherished idea of the Reality of motion must therefore go, and then possibly we can inflate Science without rupture, as long as the manifestations keep us supplied.

The third fundamental is Spacial Matter, and it seems as if the substance and volume or form are two different things. We say the substance occupies space which gives it form, but we must remember also that the substance persists in time. Having no definite sensory organ to perceive time, we are apt to magnify the importance of space and neglect the signification of Time in dealing with substance. Such has been termed spacial matter but it could have been equally termed Temporal

Matter. Again on this common basis we measure the amount of Substance by the space occupied, but the amount of Substance by means of this theory has also a value in terms of Time. This is derived from its Persistence during the appearance stage as such an idea of Temporal quantity of substance could not be arrived at so easily, possibly not at all, were the basic principle of intersistence denied.

The Space-time conception of the Relativists, as far as my powers of knowledge go, is that it is a mathematically derived conception which strictly speaking is no a conception at all, taken in the usual sense. There is no doubt that quite apart from the influence of mathematics Relativists felt that the elimination of Time, as a factor of quantity of Substance, was giving trouble: but it must be doubtful to many, whether there was wisdom in mathematically construing a Fourth Dimension. To my mind by arriving at such they have fogged the issue, which is the Reality; and thoroughly believing in my theory of Intersistence, I am naturally inclined to think Algebra in one form or another has failed them in their calculations. For useful as algebra may be, it never can have the same stability as arithmetic.

Quite apart from the incongruity met with in respect of the sign values in extracting square roots under algebraical formulae, algebra unfortunately allows of Zero being dealt with by the processes of multiplication and division, as if this were quite in order. I am, as mentioned before, a poor mathematician, but I think there will be readers, who will agree with me that anything ambiguous in a mathematical calculation is a danger. $(a-b)$ as it appears in that form can be treated as a value right through an elaborate mathematical calculation, but not so if $a=b$ for then $(a-b)=0$, which has no value at all, and therefore should never appear in any equation in the form of $x(a-b)$ where x has a value.

$x(a-b)=y(a-b)$ converted, such becomes $\frac{x}{y} = \frac{a-b}{a-b}$

and naturally this would suggest $\frac{x}{y} = 1$ which would not

be necessarily the case if $a=b$ hence $(a-b)=0$. Surely from this it must be admitted algebra is dangerous; and whereas a calculation can be checked in diverse ways by assuming all possibilities in all directions, a conception formed mathematically has only Common Sense to certify to its validity or negation. Thus non-mathematicians with ample common sense are at a disadvantage in respect of this Space-time concept. They dare not dispute it, and neither would I have done so, but for my conviction that intersistence expressed the Reality.

I arrive at the Space-time conception in quite another way, and require no mathematical help, which has an advantage in that it can appeal to all men. Before doing this it is well to discuss the third fundamental Spacial Matter as such in particular.

The substance occupying space must assume form, and we have decided that since motion is not a reality the spherical form of a unit is not called upon, indeed the nature of the Design entails the adoption of rectilinearly formed units. Besides this we have ample evidence of the crystalline nature of nearly all matter when in the solid form on which Cohesion is based in modern physics. I do not propose to introduce a medley of spacial units as being the ultimate units, in part to avoid chaos into the Reality, also to avoid meeting the difficulty in consistently explaining the reason of such varieties. The basic principle of intersistence assumes the appearance and disappearance of substance in Space and Time: the ultra-reality of substance under conditions of disappearance has already been disposed of, we have thus under immediate consideration substance occupying space. If we do not assume that the ultimate units are the simplest rectilineal forms possible, we are bound to assume that any complicated structure could make its appearance in space under the same conditions. The theory does not exactly deny this latter possibility, but considers it extremely improbable, judging from manifestations. Indeed if we adopt the simplest form or forms possible for spacial units, it lies with others to shew why this adoption is wrong.

The simplest rectilinear form known is the Tetrahedron, and naturally we select upon that figure which is equilateral, which means it is equilinear or equal-edged and equal-cornered. Such a figure can be perfectly and uniformly inscribed in a sphere. The next simple figure is the Cube and the third is the Octahedron. The series again forms three; beyond these figures which are all uniformly inscribable in spheres, we know of no others which carry with them perfect symmetry. The Rhombic Dodecahedron consisting of 12 faces having 2 pairs of 4 faces symmetrically arranged as compared to each other, but has the remaining 4 faces arranged on a different plan: for that reason this figure is not entitled to be considered as belonging to the same category of simple forms.

Therefore adopting the Tetrahedron, Cube and Octahedron as our simplest spacial units, we have to bear in mind that by full truncation of the corners, the cube and octahedron is intro-convertible; and only by semi-truncation is it possible to convert the Tetrahedron into an Octahedron.

However these details are dealt with under the chapter of Form and Posture, and it must suffice to indicate that these three forms apparently may be the ultimate units *viz.*, the Vital Forces, Energy and Matter, as manifested to us. There being no question that these three somethings appear to us as being perfectly distinct as their representations in form are. At the same time since they are intro-convertible in form we are obliged to believe that the Vital Forces, Energy and Matter will be also intro-convertible.

Modern assumptions are contrary in nature: the Indestructability of Matter and the Conservation of Energy may be termed the bed-rock where physics and chemistry meet, and on which they lie; and though there are indications derived from the study of Radio-activity, that the element Helium and an Electron are indetical, there is still that feeling that the matter of the Cosmos is a finite quantity for all time; and if is not, then the

Electronic Theory of Matter still builds on the idea that the total quantity of Energy and Matter as energy, is finite for all time. The position of the Vital Forces in this is not indicated, but sooner or later the connection of this with Energy is bound to take place, and then I presume the "Finite quantity" will apply to all these three somethings, resulting in further confusion.

It is not necessary here to state anything more concerning the substance as conditioned in space, as forming what may be termed the ultimate unit of spacial matter. We have it is as a definite form intersisting and we can occupy ourselves in the examination of substance in its temporal form and such relationship to the spacial form as is necessary.

By the occurrence of phenomena or events succeeding each other, we are able to ascertain the quantity of Time taken up during the appearance of a unit, and this has already been adverted to; the result arrived at was, that the substance of spacial matter (used in the broad sense) possessed persistence in time in correspondence with volume in space.

Now, if we imagine substance intersists in time alone, we find that it takes an appearance, a disappearance and a reappearance to constitute the idea of persistence. If we combine this with the spacial relationship, it can be seen that the volume of one unit may be greater, equal, or less than another unit; it can also be seen that the duration of appearance of the one may be greater, equal, or less than that of another unit. If we let the volume of A unit= V and the duration of appearance= T , we have VT expressing something which may be greater, equal, or less than vt derived from b , another unit of volume v , and duration period t . Suppose the phases of intersistence of both units are equal in time, then it follows that the amount of substance persisting in time can be different in respect of A and b units: hence though the space occupied by a spacial unit may describe absolutely the amount in 3 dimensions of space, the real quantity of substance intersisting is measured in both terms of

time and space, which can be generally put as V T.

Later on it will have to be decided what will be the unit of time and space expressed in terms of our present dimensions. Of course the simplest will be, when the durations of appearance and reappearance will equal each other.

In this way we can view the nature of Time-Space of Relativists without the aid of doubtful mathematics ; and, as mentioned before, since the idea of Time-Space has been a necessary conception for those who wished to reach the Reality, we can feel a certain amount of satisfaction in having this concept logically forced on us by our basic principle of Intersistence.

Figure.	Face.	Corner.	Edge.
Tetrahedron	4	4	6
Cube	6	8	12
Octahedron	8	6	12

From this we see that 4, 4 and 6 of the tetrahedron added produce 6, 8 of the cube, and 6, 8 of the octahedron. It can also be seen that there is evident numerical relationship between the cube and

octahedron, this necessarily follows from the fact, which can be obtained experimentally, that the cube and octahedron are reciprocal figures; that is one can be derived from the other by symmetrical and regular truncation of the corners by planes, which go to form the faces of the derived figures. We also see that the number of the faces in series stand in arithmetical progression as 4, 6 and 8, and if we extended such to 10, we would find no symmetrical and equilateral figure could be possibly formed out of 10 faces. We experienced the reversed effect when we tried to introduce a pentagon in the series composed of a triangle, square and hexagon inscribable in a circle, "5" therefore in the planal aspect, as "10" in the solid are dissentient numbers. On the strength of the foregoing discoveries of relationship, we naturally look to our Reality for correspondence, and knowing we have three fundamental types of substance which we have termed spacial matter, we are entitled to tentatively assume that each of the three types of figures will correspond with the three manifested types of those things, which we know move through space, hence occupy space. These are the vital forces, energy and matter.

We are now treading on debatable ground, and though somewhat of a digression, I have considered it advisable to settle this point first, and then return to the further investigation of the three fundamental forms.

I am not in a position to give the latest developments, but the direction of Atomicity is to treat the atom as a planetary system, where the main planet is considered to be a positively charged nucleus, and the satellites are able

to behave as such, in that they are taken to be negatively charged "electrons."

We are not here criticising the theory, which is reserved for a future chapter, but we have to take into consideration the direction in which this theory is leading. The tendency is to resolve all matter, as we know it, into systems or segregations of what may be termed point-forces of electro-magnetism. Energy likewise gets resolved into the same constituents, and we can presume that the vital forces will be similarly treated at a later date.

This would mean that as time advances and experimental experiences are gained, the three fundamentals will be shewn to be intro-convertible. In fact there is much evidence in believing, that the alpha radio-active ray is the element Helium; and the breaking-up of the long cherished elements into numerous isotopes is undoubtedly a step in the direction of the ancient idea that metals, hence elements, were transmutable.

We are bound to take into account any new manifestation in our elaboration of this theory and discard the uptill-now modern theory of the indestructability of matter. But we have this in hand, that though the atom may be disintegrated, it has not been "synthesized." Therefore, admitting the three fundamentals are composed of ultimate units common to each, such an application to our theory would mean, that if an octahedron by truncation is converted into a cube, such must have a smaller volume relatively to the octahedron; we thus get to the point whether the volumes of our units are constant or not, which is a matter really requiring deep consideration. However, I am inclined to think such can never be so, for if we intend to build up a system consisting of a medley of differently sized bricks, such seems chaotic and must be ruled out.

But we can proceed with our investigation of Form,

if we consider it in the light that we are collecting facts with a view of application. We must also bear in mind we can produce diverse figures not only by adding similar parts together, but we can reach diverse results by truncation of corners, as well as edges. We can also super-impose coinciding figures on the faces. With such under question we can proceed.

To convert a tetrahedron into an octahedron by truncation of the corners, the process is only carried through half-way, that is portions of the four faces of the tetrahedron go to form four faces out of the eight faces of the octahedron. This is different, when we derive a cube from an octahedron or an octahedron from a cube; the process of truncation is carried right through and the existing faces are entirely destroyed.

These conditions naturally suggest that as the vital forces and energy are more similar to each other than to matter, the former would be represented by the cube and octahedron either way, and the tetrahedron would be reserved for matter. This cannot be taken as conclusive and is only suggested.

Now if we partially truncate each corner of each type, we get the following relationship :—

Figure.	Face.	Corner.	Edge.
Truncated Tetrahedron ..	8	12	18
Cube ..	16	24	36
Octahedron ..	16	24	36

Under these conditions, the numerical relationship of the three types is more evident. The ratio 8; 12: 18 is constant for each

type. The cube and octahedron in partial truncation naturally are absolutely similar figures.

The evolution of one type into another is clearly seen from the following table by counting:—

Process.	Tetrahedron.			Cube.			Octahedron.		
	4	4	6	6	8	12	8	6	12
Partial truncation ..	8	12	18	16	24	36	16	24	36
Complete ..	8	6	12	8	6	12	6	8	12
Total ..	20	22	36	30	38	60	30	38	60

To study the numerical relationship it will be convenient to do this graphically by grouping the numbers as follows:—

<i>Tetrahedron</i>			<i>Cube</i>			<i>Octahedron</i>		
(4)	(4)	6	(6)	(8)	12	(8)	(6)	12
[8]	12	18	[16]	24	36	[16]	24	36
8	6	[12]	8	6	[12]	6	8	[12]
△20	22	36	△30	38	60	△30	38	60

—: If the difference of the numbers in the circles be added to the sum of the numbers in squares, we get the number in the triangle; shewing that all three types in a state of evolution have something in common.

<i>Tetrahedron</i>			<i>Cube</i>			<i>Octahedron</i>		
4	4	[6]	6	8	[12]	8	6	[12]
8	12	[18]	16	24	[36]	16	24	[36]
(8)	(6)	12	(8)	(6)	12	(6)	(8)	12
20	22	△36	30	38	△60	30	38	△60

—: Then again if from the sum of the numbers in the squares the difference of the numbers in the circles be

deducted, the resulting number is to be found in the inverted triangle.

<i>Tetrahedron</i>			<i>Cube</i>			<i>Octahedron</i>		
(4)	4	6	(12)	8	12	(18)	6	12
8	12	18	16	24	36	16	24	36
8	6	12	8	6	12	6	8	12
20	22	36	30	38	60	30	38	60

—: Again if from the sum of the numbers in the squares the difference of the numbers in the circles be added, the resulting number corresponds with the number in the triangle.

Such correspondences, apparently of little significance, undoubtedly shew that a numerical correlation between these figures can be established from the faces, corners and edges of these three rectilinear figures in quite a different manner to which correlations are established trigonometrically.

We can take note that the octahedron alone possesses corners formed by 4 edges meeting, the other two types show three edges to any corner, and the same applies to the derived figures. The octahedron by this stands uniquely in a class by itself.

If the sum of the number of faces and edges of an octahedron be divided by this function 4, we obtain a whole number, namely, 5; if the cube is similarly treated by its function 3 we obtain the number 6: The tetrahedron in this matter dissents.

With a point in the centre and lines radiating out to the corners, we can divide a cube in 12 parts, the octahedron into 8 parts, and the tetrahedron into 4 parts. Each part is the simplest possible figure; namely, a tetrahedron.

At this stage it is impossible to lay down the principle of construction of any compound form out of the units of each fundamental type. If we adopt this tetrahedral

system of building, we can see that to construct a symmetrical form in the first instance, we must have 12 units to form a cube, the second stage of symmetry by adding would mean a total of 24 tetrahedrons; this would expose equilateral faces, it is true, but the greater face of the unit tetrahedron would not be exposed for building on. The third stage would add on 24 tetrahedrons; making total of 48 units, but at this stage the angles formed by the faces would be re-entrant. With an octahedron the first stage means 8 units; the second stage would be mean a total of 16 units, and so on; but to follow this out is impossible without models. The original equilateral tetrahedron could be treated in the same way.

I should imagine, that since the tetrahedron is the simplest figure, all units of the three fundamental types would be in that form, though the unit of each would be a-symmetrical; and further that there is some fundamental meaning derived from the fact, that the equilateral tetrahedron has 4 units, whereas the octahedron has 8 and the cube 12 units.

On the other hand a system might be compounded by simple addition of cubes on to cubes, and octahedrons on to similar octahedrons and so forth.

A decision on this matter I feel can only be reached, when a definite correlation between the spectrum lines and atomic weights can be made out to exist; for it will be seen in a future chapter that the shape of any compound of units will determine the distribution of lines in its spectrum. Further, so far it can be said, we have not heard the last in respect of the periodic law of elements, and we have heard very little of such in connection with the chemical compounds. However, even if this subject is tackled from the nature, of form, though laborious work, indications may be given, which will assist in correlating the spectra with atomicity in a finite and definite way.

It stands to reason that any equilateral symmetrical unit, such as the tetrahedron, cube or octahedron can intersist in different postures within a sphere. This

hypothetical sphere can be conveniently termed the Sphere of Co-ordination. It can also be easily seen or be proved experimentally, that the spheres of co-ordination of two similar units having like forms can intersect, provided the postures relatively to each other are dissimilar. Thus if this intersection of spheres of co-ordination exists, such may be construed to constitute the state of cohesion; this allows of any unit to intersist in different postures, even if the intersistence in one position of space entails such are the real conditions of the state of solidity of matter.

The possibility of such a condition occurring is of considerable importance, in that it gets rid of those incongruous conditions that arise in considering kinetic molecularity in relation to cohesion of solidity. The weak point of these theories, not excluding the Electronic Theory, is that we are faced with violent molecular movement in a solid which shews no evidence of internal commotion; besides there is no convincing explanation as to the nature of the mechanism producing cohesion; there being no question that cohesion must be force, which somehow keeps the parts together opposed to the action of a disintegrating force. As said before, it is difficult to see how this can be carried out with innumerable mobile molecules. Even liquids and gases shew viscosity, and this can only be construed as weak cohesion.

In this theory we are in a better position to produce a state of cohesion by the intersection of the spheres of co-ordination, thus allowing the unit to possess innumerable different postures in consonance with its frequency of intersistence. To illustrate such, we fashion our state of cohesion by binding the ring-frame works of the innumerable gyroscopes, yet allowing all such to continue their rotatory movements. Of course this is not the actuality and must only be treated as an illustration to shew how a unit can intersist in one position of space with varying postures, yet allowing of definite cohesion. And, further, we gain by this assumption of the Reality, in that the dispersive nature of light can be explained,

which will be dealt with later on.

We are not yet in a position to lay down any rules in respect of change of posture of units, which, I think, will bear absolute correlation with the spectrum lines on deeper investigation; and what has been stated in regard to posture has been done so in the Chapter chiefly dealing with form, merely with a view of shewing another possible condition of spacial matter intersisting and producing one of the most abstruse manifestation we know of.

If we take 5 spheres as our base, the 6th sphere will bring mutual contact. The intervening space is greater than the last, and the 6th sphere lies deeper down, than with the 5th super-added sphere to the cubical base.

We have thus only three conditions of this state in which the super-added sphere is supported by the base; for as soon as we make the base with 6 spheres touching each other at 6 points, through which a circle can be described, the 7th sphere will fill the gap, and will not be supported by that base. This can be easily geometrically proved. Indeed by inserting this 7th sphere we have formed thereby 6 tetrahedronal bases.

I presume the reader has again noticed the conditions of triadism in that the super-imposed sphere is only supported by bases having 3, 4, or 5 spheres. The conditions cease on the fourth trial with 6 basal spheres.

The building up on the tetragonal system can only be carried out in one way, which determines that there is always absolute uniform mutual contact: If, however, we try building on the cubical system we find absolute mutual contact is not obtained, which same remarks apply to the system with a pentagonal base.

With these conditions established, it is possible to believe that as we are dealing with dense units as representing the solid variety of matter, we have possibly arrived at the reality of the conditions manifested as the brittle, pliable and colloidal or jelly states of solid matter; and that hardness or softness are dependent on the unit intersisting in virtually one position being of the hard scale, and when intersisting in positions somewhat removed, such would carry with it softness.

In all probability the intersistence is really in 3 positions, which would practically coalesce into one point of intersistence as manifested in a diamond. Though this may be so, it all depends, whether the co-ordination is tetrahedronal, cubical or pentagonal. These arrangements decide the brittleness to the colloidal state which is generally termed an allotropic modification. But it is perfectly true that we cannot associate hardness with a

jelly, though we can do so with brittleness and pliability. In the reverse way, we cannot associate softness with brittleness very easily: but if we examine and test Graphite and Talc, it can be said a brittle soft substance can exist.

However it should be borne in mind, that the nature of the colloidal state is the permeability of liquids; and it may be, that its apparent softness is a coincidence and permeable hard solids will become known, as has been the case with steel being permeable so far as mercury is concerned, and palladium so far as hydrogen is concerned.

In any case, at this stage, we are entitled to plead a certain amount of uncertainty, in that we have not taken into account intersistence in its temporal aspect; indeed hardness and softness may be associated with those conditions over which we may receive enlightenment hereafter.

The main point has been to shew how to deal with the spheres of co-ordination, and that in solids the intersection of the spheres are regular and not severely changeable; in that the three positions of intersistence are probably less than the diagonal width of a unit; which means that in solids we have spheres of co-ordination, that intersect regularly as there are only three positions of intersistence in each sphere. No doubt the spheres do not intersect permanently to a definite extent, and, for that matter, we have no solid absolutely rigid. But the intersections are not irregular, as will be seen with liquids and gases, which we now can deal with.

If the solid with its three positions can be visualized as vibration, the liquid should be visualized as gyration in an approximate way, and a gas could be visualized as, what I must term, spherical rotation. This is the third state of continuous motion possible. I feel however, that any unit whether representing matter in the solid, liquid or gaseous state will have a centre point of intersistence, and this will coincide with the centre of the sphere of co-ordination.

We now come to a point which must be entered here for elucidating what is about to be explained. As long as spacial gravity units infest every portion of space on this globe, we can never get a manifestation of the reality in the absence of their interference. The solid will always tend to press and pass vertically downwards, as a liquid will spread as well as flow downwards, whereas a gas will diffuse in all three directions.

Now if we eliminate the interference of gravity a perfect liquid would show planal intersistence, the spheres of co-ordination would resemble the flat blood corpuscle. Although it cannot be easily explained, it can be clearly imagined that as the unit of a liquid is intersisting alternately at the centre of co-ordination and at the circumference with a gyratory progress along the circumference, the intersection of the imaginary spheres of co-ordination may be far more intense, than in the case of a solid; but the regularity or permanency has disappeared. In this way would I have my readers see, that the cohesion of the units has weakened into what we term viscosity. If now gravity units are permitted to interfere, it can be easily seen that the spheres of co-ordination, which intersected each other in one place, will now appear working up to a jumble of blood corpuscle-like-spheres of co-ordination, but as gravity only interferes in one direction the planal nature of a liquid is never entirely destroyed, that is the conditions never reach a state simulating the spherical rotatory intersistence of a gas. Heat which radiates in all directions would produce greater obliquity, which as we know finally results in the liquid boiling and becoming a gas.

The reader acquainted with the kinetic molecular theory, may be tempted to see no difference in my exposition; but it must be distinctly borne in mind my units intersist, hence do not move. My volume of liquid or gas is increased or diminished by interference of spacial matter added or subtracted; there is no force pushing them apart. Each unit insists upon reappearance, and if there is no room, the thwarted insistance produces that

extra pressure a liquid or gas will exert, if confined under those conditions.

Although I am unable to do so here, it may be later on shewn by these means, why the viscosity of a gas increases with rise of temperature; whereas such is not the case with a liquid. It may also be shewn why some substances in the solid state behave irregularly under variable conditions. But even if we could explain these things, such does not strictly belong to this chapter: the point has been to shew how the units of dense matter can be considered to have imaginary spheres of co-ordination to account for the strongest and weakest cohesion in matter as we know such. And more, it has shewn us the nature of the unoccupied space of a system of units, wherein we can thrust other spacial units, which will be done later on in the chapter on Cohesion, which deals with the architecture of a System.

Chapter VI.

Phases.

The unit, which has volume, in its intersistence appears for a definite time, and succeeding which there is a certain period, during which the unit is annihilated; or in other words the unit during that period is in a state of disappearance. Both states of appearance and disappearance are instituted instantaneously, there is no minimum or maximum effect in the operation; that is, there is no time absorbed in the making of the appearance or the bringing about of the disappearance. In fact, this is really the very substance of this theory. A thing is or is not; there being no continuum is the very essence of the whole argument.

As long as we worked with motion, the idea of instantaneity was difficult of comprehension. Relativists thus deluded themselves into the idea, that in the reality nothing was instantaneous, since there was no absolute criterion to decide the matter. And it seems to me the difference between us is, that Time with us is an invariable and they have chosen to consider the contrary. By contemplating the intersistence of ultimate units, we are able to adhere to the invariability of Time and equalness in Space; indeed we are able to view the ultra-realities of Space, Time and Substance, as infinite continuums, and discreteness only enters the Reality by their interaction. Our Design is a logical consequence of this view, in that we are going to pack infinite space with substance in infinite time, and we are only concerned with their interaction; and we can feel sure that, if such were not infinite continuums, the design, would have no logical sanction.

It is not the human mind that has made finite quantities, but it is the nature of mind that has allowed finite quantities to exist. It is the abstraction or, better put, the continuum though vague or faint, that is existent;

and in this we are allowed or can form pictures. Indeed it can be easily seen that no judgment can be passed on these continuums, which I feel have been erroneously called abstractions; in that without the innate idea of good and bad, I fail to see how any act of behaviour could be construed as good or bad in itself. If we had no continuum idea of quantity, how would it be possible to indulge in mathematics? Swimming has no meaning, unless there is something to swim in. The ocean is not an abstraction from the swimming fish.

Instantaneity, the Euclidean point and the mathematical zero must be something. Hence the idea of indifference, where a thing is this or that, or is neither. The triadism of the nature of things, which apparently no man can alter or has any desire to do so. If there are two ends there must be a middle, which is neither the one end or the other.

It is thus with Intersistence. We do not, nay cannot confound the beginning and the end of the appearance of a unit with the state of appearance itself. Creation and annihilation are instantaneous acts as the processes of addition and subtraction are. We cannot half-add or subtract; that has no meaning. It is immaterial to us as to how many vibrations are necessary to produce a particular note, but we are concerned with the sudden appearance of that note; we either hear it or we do not.

And the benefit to be derived by embracing this theory of the Reality, that though finiteness is apparently ever changing, we have not removed instantaneity from the Reality, but we have shown how it is beyond our ken. When we can detect the frequency of intersistence and volume of a unit, we will be no better off, in that our senses intersist as much as everything else, but we can judge finiteness by the incidence of two points, eventually; that is we will always be able to know a quantity by our power of subtraction, the annihilator.

Simply because we are unable to perceive a unit intersisting, we are not entitled to say it cannot in reality happen. We can only judge from what we know and

we find that (1) is sharply divided from (2) and $(1 - 1)$ is zero; and there is no half way thinking about it

Having established the above in shewing that a beginning and an end are instantaneous in effect, we obtain a definite and finite quantity, and whereas Planck's ultimate quanta persist, ours intersist; and more than this we can shew how the ultimate units in composition are quanta in that scientific sense.

The basic principle of this theory assumes all ultimate units of each of the three types to have the same unalterable volume and form; and correspondingly it might be held that there could be no variation in the frequency of intersistence, but if the latter were so there could be no packing of space; the object of the Design would be defeated. It therefore appears, that the frequency of intersistence must be variable and it is our business to determine the laws governing such.

We will now investigate the possibilities in that direction by assuming that the volumes and figures of the units are similar and invariable. This for convenience.

Let us denote the period during the state of appearance by the symbol (B) and the corresponding period of disappearance by (D), the time phase of any unit can therefore be expressed by $(B + D)$. The number of time phases in any particular time (T) would be represented by the fraction $\frac{T}{B+D}$, which signifies the frequency (f)

Now, if we for example take two units each of volume (V) it can be readily seen that although the frequency of each may be similar, that is equal, the product VB, in the one case need not equal VB_2 in the other case; that is though $B + D$ equals $B_2 + D_2$, B need not equal B_2 ; nor need $D = D_2$.

The product of the volume into its period of appearance thus has a physical meaning. VB is in a sense the symbol of temporal substance or time-volume.

Spatial substance can be arrived at in a similar way by noting the number of times any particular unit makes

its appearance in a defined amount of space. It is merely then a matter of the proportion of that space occupied by a particular unit; thus if (x) equals the space occupied by a unit and (y) the unoccupied space, then $(x+y) =$ the spatial phase, this can be virtually expressed as being the distance of loci of reappearance. And if we use S as being any particular volume $\frac{S}{x+y} = n$ the number of times the unit appears in that particular space.

Now if intersistence is to be adhered to, neither B or D can vanish to zero, that is there must always be some duration of appearance as well as disappearance. If we apply this to the spatial phase, both x and y must also always have some values which means that a unit cannot interstist in absolutely the same place for all time. And this has been our contention that the manifestation of Rest in the reality has no correspondence. This appeared to have empirical sanction in that a top can never be made to stand up, though according to modern physics theoretically it could. Again in the chapter on Form and Posture it was agreed, that change of posture not only had to be assumed, but could reasonably be assumed to be the nature of things, and considering we are dealing with rectilinear figures and not spheres, the space occupied by a unit in various postures must always vary as well, even though the volume and centre of posturing are constant. This need not be taken into account at present, but it must not be lost sight of when Cohesion receives attention.

Let us suppose that with a dense unit the product of the Volume (V) into the period of appearance (B) into the frequency (f) is always constant then $K = VBf$, since V is a constant measurement, B must vary inversely to f; that is Bf has also a constant value. We thereby obtain a unit with a minimum period of appearance entailing increased frequency. The period of disappearance must therefore vary proportionally to B; that is $\frac{B}{D}$ is a constant.

Presuming we wish to produce interference by means of another unit of similar volume, form, etc., this can be done if the period of appearance of the second is greater than the period of disappearance of the first unit; provided of course the time of interexisting allows of such. The first unit in that case must suffer displacement, which means it must reappear in a fresh locus, which is motion.

Now had the second unit a smaller volume, it would have similarly caused displacement by interference through the time phase; in that we adhere to the assumption that an ultimate unit can neither change its form nor volume. Time and not Volume is the interfering factor.

The gravity unit thus reasonably seems to possess a lengthy period of appearance (B) and a very short period of disappearance, and from the nature of gravity we can safely believe that its volume will be extremely small as compared to a dense unit. But if the constant K_G for gravity $= (VBf)_G$ the frequency will be very low.

We can thus picture at one end of the scale a dense unit, representing a solid with the highest frequency possible (f) and the shortest period of appearance (B). Whether $\frac{f}{B}$ for gravity equals $\frac{B}{f}$ for dense units is a mere matter of speculation, and the ratio must be left for future workers.

Anyhow we want to make it possible for gravity to interfere as much as possible with any system of dense units; and the longer gravity units delay therein, when once they have made their appearance, so much the more interference produced.

Now if we assume that the product formed by an energy unit's volume into its period of appearance by the number of appearances made in a definite distance of progression is constant, and assuming the speed of progression of all radiating energy units is constant, we arrive at the result that number of appearances will vary inversely to the period of appearances, which means

that the distance of the loci of gravity will be greater than those of electricity, light and so forth.

In this way can laws be established *re* phases. The only sanction we have is mathematical. This procedure was adopted and permitted by modern physics in respect to the correlation between the velocity of light, its wave lengths and frequencies. Originally this correlation was mere guesswork, which received empirical sanction afterwards.

If there were no mathematical correlation as suggested, we would be surprised in expecting otherwise; but we have at least a reasonable foundation, in that we can conceive the phases of units varying in time; and if so we have kept the quantity of the substance in intersistence constant. We have done the same with energy units in considering the same amount of substance must intersist in the same space, if its phases vary. I have adopted the most likely mathematical correlations by giving time-volume a meaning. This as the reader probably knows corresponds in meaning with the relativists' four dimensional conception of Space-time. The difference only lies in the method adopted for arriving at such a necessary conclusion. Thus substance in a state of appearance is measured by Time.

Our basic principle has been that substance (occupied space) appears in space interersistently, and that the units are ever increasing in number; if the whole can vary, the parts can; and on the strength of this we found the time and spatial phases. VB, or time-volume is of every significance in this theory, and it allows us to predict that matter moved through space with an ever increasing velocity will have its time phase altered, as much as its spatial phase has been altered. The criterion will be the Constant. Whether thereby we will be able to convert matter into energy cannot be decided here, partly in that we have given matter, energy and life-force three definite rectilinear forms; but I am inclined to think that in years to come after thorough establishment of this theory the investigation of an ultra-reality will merge all

occupied space into one thing. This the reader knows is already being attempted at in the Electro-magnetical theory, but I feel almost certain such will never succeed in that the Conservation of Energy and Indestructability of Matter are adhered to; from which follows the quantity of both is finite, and is therefore never on the increase as with us. This makes a great difference in accounting for the apparently ever increasing manifestations in the universe, more definitely shewn in the evolution of Life.

Chapter VII.

Modern Theories.

Prior to writing this book, in discussing various scientific subjects with others, the point constantly arose as to the value or importance that could be attached to any of the modern theories, apparently directed towards the elucidation of the ultimate constitution of matter.

Generally the idea is, that these theories are merely used as working bases with a touch of conviction, that they are not far out from the reality. For if they appeared faulty Science, ere this, would have repudiated attaching any value to them even as working bases. But the sure test of their value can only lay in their mutual correspondence, or perhaps, better put, in their consistent correlation. This test has never been carried out to a logical conclusion, probably because it cannot be done; but it seems an unwise policy to adhere to theories, entirely hypothetical, in the absence of a clear understanding as to their connection. It is appropriate that this chapter should be entered here, before proceeding to the elaboration of the theory of Intersistence.

That theories direct thought and permanently influence the trend of thought is undoubtedly the case, and experimental work is naturally only undertaken to further consolidate the theory. Anybody experimenting in direct conflict with known laws can only expect to be considered a lunatic. This punishment is avoided by strictly adhering to the present scientific convention. Hence it is only by accident, that an unexpected result is brought to light; like Marjorana's absorption of gravity. And it stands also to reason, that an unlooked for event is more liable to escape detection, than what is anticipated.

No doubt an unexpected event, if unaccountable, necessitates alterations of the body work of some particular theory, which by its nature should account for it;

but this is not by any means always the case. The relationship of pressure to the volume of a gas only remains constant for an ideal gas, and the atomic heat of elements in a strict sense is never constant; yet both Boyle's and Dulong Petit's laws remain unaltered as physical laws of first importance. The most that has been done has been to devise empirical formulae to clear off the exceptional cases.

No doubt water rising in a capillary tube against gravity suggested a force, lying somewhere, capable of producing this seemingly anomalous phenomenon, giving the idea, that liquids behave as if they were enclosed in a membrane under tension. But experiments shewed that the tension of a liquid was independent of the amount of stretching, thus not in agreement with the nature of an elastic membrane. So, as with the action of gravity these elastic mediums could neither be found or be believed in, culminating in acceptance of the principles of action at a distance.

In this way the surfaces of liquids and solids were endowed with surface tension; whatever this may mean. Anyhow it is a force that must not be confounded with the force of cohesion of solids, be this different to that of liquids. Liquids are known to possess greater tensile strength if freed of physical impurities, than in the impure state; so that the idea of molecular attraction being common to cohesion and surface tension is tenable. But here again, it is necessary to assume the existence of a force of attraction between the molecules different to the force of attraction, as laid down in Newton's theory of the gravitation of matter. Ordinarily, if the force of attraction of two bodies is proportional to their masses and inversely proportional to distances squared, no amount of reasoning will allow us to believe the law is variable even beyond certain limits of distance. Laplace in his theory of capillarity assumes, that the force of attraction of two molecules suddenly increases, when the distance becomes very small; and this only applies to the superficial molecules and not to the molecules in the body of the liquid.

Even if that be granted, though we get a good impression how the spheroidal shape of small volumes of liquids are formed, we get no explanation as to why the curvature of a globule of mercury undergoes spontaneous alteration. This surely requires explanation, and its importance in bearing on this subject stands on a par with the coalescence of drops of water being facilitated by the presence of an electrified body.

If a liquid does not wet a solid body repulsion is shewn between the two; and on the other hand, the fact that a liquid wets a surface presupposes attraction exists between the two. Oil can be said not to wet water, or in other words they are not mixable; yet oil will spread as a thin sheet over the surface of water, and water will not, on the other hand, spread over a sheet of oil; but will, if small in volume, form globules.

It seems that surface tension produced by molecular attraction can not alone account for these anomalies; and as it is the object of this chapter to expose the weaknesses of current theories, it would be a digression to undertake attempting to explain such.

Tension of a certain intensity denotes equilibrium of those forces engaged. So far as we can see, water lying in a glass vessel for the time being has its surface in equilibrium in clinging to the sides and lying flat between the same. The molecules of the surface are obviously at rest relatively to each other, in that they, by that attractive force with which they are endowed, are thus held together. This state of conditions is at variance with the Kinetic Molecular Theory of Matter. Here we have our molecules in continual motion, in that the theory undertakes to explain pressure by means of the molecular quantum of momentum derived from their rectilinear motion. It is not necessary here to enter into the question, as to how these molecules are endowed with motion for all time, but it is pertinent to the subject to demand an explanation as to how the molecules of the surface of a liquid lose their rectilinear motions, so as to arrange themselves into a film under tension. The reader can easily see the position is

absurd, in that the matter can be put as follows; either the surface film is under tension, and the kinetic theory is at fault, or the kinetic theory is true and therefore the molecules of the surface film cannot be held in a state of tension. Probably it is better to say neither side is correct, and that it will require another idea of the constitution of these things to bring the pressure of fluids into line with the phenomena of capillarity.

As a matter of fact the Brownian movements of a liquid clearly show, that inter-molecular movements are going on for all time; and any observer can notice that the surface of water can be moved about without ostensibly affecting the state of rest of the water clinging to the inside edge of the glass containing it. The state of tension, as supposed in mid-water, certainly does not behave in this respect as an elastic film; in fact there is no elasticity in it; and if there is no elasticity, which is dependent on cohesion, it is not easy or even possible to realize tension, if there is nothing offering resistance to the stretch. There is therefore much to make us believe, that if there is tension, it is produced at the time of contact; and that Laplace's idea of molecular attraction being confined to the surface of a liquid, and in its extended form also to the surface of a solid, is neither borne out by facts in a regular way, nor has it really any sanction to exist as an assumption, in that it is incongruous with the ordinary acceptance of gravitation. It is impossible to endow each molecule with two inherent attractive forces, The molecule either obeys Laplace's law of attraction or Newton's. For after all, we can only judge of the existence of a force by its effects, and so far as we are concerned in this instance, the force of attraction accelerates the motion of the masses under attraction. We can therefore only add Laplace's force and Newton's force together, but if this is done, considerably more elucidation is required to shew, why Laplace's force not only makes its appearance, but some reason must be given why that force only acts in a plane corresponding with the surface film of the liquid. Indeed it might be asked, why is it not supposed that this force is in action in the complete film

forming the skin of the liquid enveloping any shape and volume the liquid as a continuum happens to possess. For what difference would there be, if the film lay in contact with another surface of another liquid, or against a gas or solid, or even were exposed to vacuum; considering that when the volume is small and assumes the spherical form, this film-acting-force is called into existence.

A soap bubble is undoubtedly a spherical skin, but it has this peculiarity, in that its thickness is variable and experiments point to the fact that the variations in thickness are markedly abrupt; and that though the surface tension is irregular in the process of formation, finally no change is to be observed,—at least of any consequence. If then Laplace's idea of tension is applied to a soap bubble film it stands to reason, that as the thickest part is a couple of hundred times thicker than the thinnest part, the molecular attraction of the molecules of the thinnest part must be considerably greater than that of the thickest part, so as to bring the surface tension into equilibrium in order to account for the spherical shape assumed. So on this, molecular attraction and the surface tension do not appear to be the real conditions of the above phenomena.

The raising of the temperature of a liquid clearly must reduce the surface tension, in that when a liquid boils the surface tension of a liquid cannot be considered to be in a state of tension equilibrium. Heat does not effect the force of gravitation, and therefore it would not affect Laplace's molecular attraction, but heat undoubtedly reduces the surface tension, assuming such is in existence. Unfortunately modern physics is not at all clear as to what Heat is. It is needless to remind the reader, that our Heat is substance occupying space, but this is not by any means accepted at present; and though Einstein is reaching a corpuscular conception of Heat, such cannot be taken to be a modern idea of physics. Generally heat appears to be considered a vibration of something so that $\frac{mv^2}{2}$ as energy may have some thermal meaning. The Kinetic Theory, I think, has its molecules shivering with heat, as

they progress with their so-called rectilinear motion to account for pressure. But when applied to solids the kinetic theory is compelled to assume heat to be connected with the amplitude of vibration of the atom, and therefore unconnected with the molecule. The whole matter is extremely obscure, and it seems hardly worth dilating on it; but it certainly seems, that some other mode of producing surface tension is required, if the effects of heat are to be taken into account. One thing is quite certain, that we are not going to be satisfied with a stretched substance keeping under constant tension, whilst portions (molecules) are being removed and replaced. If not, then there is nothing to preclude a gas from having a surface tension. This cannot be the case, in that all gases are miscible; that is they diffuse into each other with the greatest ease. As stated previously, a wiser decision is to study the matter in the light, that these surface tension effects are produced at the time of contact.

The so-called surface tension of contact is restating the fact that, liquids wet solids; and when they do not as in the case of mercury and glass, the surface tension is said to be of the opposite sign. If the question is asked, why a liquid wets a solid, it is booked down to surface tension, but what we have previously understood to be surface tension surely is not the same thing. We can understand Laplace's idea of a molecular skin, but fail to see how this will account for water rushing into a capillary tube. And even, if there is adhesion of water to glass, it does not exactly explain the consequent motion in capillary attraction. These tensions are really treated as unbalanced forces, and are founded on the tensile strength of liquids in air, which are the capillary constants. When a second liquid or a solid is introduced, the other tensions between the different substances must be taken into account for calculations.

Only on the strength that, possibly all tensions are continually subject to slight variations, is it possible to generate motion of the liquids; and seemingly on this, have we to rely on the motion imparted to bodies floating on

the surface of liquids. But it is doubtful, whether such explains the expulsion of water in a greased capillary tube by oil.

A study of the movements of substances floating on the surface of water contained in a vessel gives room to doubt the universal application of the modern laws of capillarity; and if not universally at our disposal the nature of these seemingly spontaneous movements in capillarity deserve another and a sounder explanation.

The Electronic Theory begins and ends at the atom; the larger sized molecule has a different constitution; and any system of molecules in a state of cohesion, as in a solid body, has again apparently another constitution, which has not been made clear up to date.

Yet Physics seems satisfied with these diverse systems of architecture so contrary to nature's methods. The atomic parts of an atom are in dynamical equilibrium, as opposed to a statical construction, yet still they are cemented in a way together with that obnoxious force, Action-at-a-distance,—like unto a constellation of Newtonian imagination; yet so unlike all finite systems in dynamical equilibrium as known to our senses; and, of course still more at variance, with the statical productions of human architecture or even Nature's.

But our experience is that most systems in dynamical equilibrium are mobile, like animal organisms, and those that are not, are fixed to the earth by the same substance of which the dynamical parts are composed of; such fixidity is not dependant on forces acting at a distance. It can therefore be argued, that if the atom is kept together within a hypothetical sphere by what is called electrical attraction, the atoms themselves in molecular equilibrium should be cemented together by a similar force of electrical attraction; and this should be continued right through, even unto the dynamical equilibrium of the Constellations which they are trying to copy. Cohesion in this way clearly must be electrical attraction and gravitation cannot escape from being included there-

in. Such a consistency in construction may be yet arrived at, but it does not appear, that theories hearing on the constitution of matter lean towards it.

If we take the nature of the two bodies pictured as the negative and positive electron in the electronic theory, one thing stands out clearly, which is that like signs of polarity bring about repulsion at a distance, and unlike signs cause attraction. This is obviously so, in that the negative gyrating electrons of an atom do not collide with each other, but appear as discrete "momentums," kept apart by a force of repulsion; which same momentums counteract the ever prevailing force of attraction between the negative bodies and the assumed central portion or positive nucleus. Electrical repulsion is however not admitted in statical electricity, for it is considered that two bodies of similar electrical polarity are really attracted away from each other by the complimentary opposite signs, existing always in the correct position in a direction, which is the line joining their two centres.

If these conditions had to be applied to an electronic atom, with very little reasoning it can be foreseen, that this adjustment to render repulsion in terms of attraction must be extended infinitely, which not only appears absurd, but is a result in direct contradiction to the object aimed at, which is to construct every thing out of ultimate finite and discrete units.

It is not in accordance with scientific etiquette to bungle over this matter of repulsion and attraction, ostensibly for no other reason but to bring! such in line with the known gravitational effects of attraction, in which there can enter no idea of repulsion. Either similar signs of electricity produce repulsion, or they do not. If such is the case in the electronic atom, then it must be so in all cases in dealing with electrical charges. If repulsion is not existent in the atomic structure, then sooner than devise adjustments, which can have no end, it would be better to believe the electronic constitution of an atom is at fault.

Although electricity is normally considered to be a form of energy, and much in the same way as with Heat and Light, this is really incorrect, if the quantity of energy is measured in the terms of Work Done. For in this way it cannot be said that a quantity of electricity is a quantity of energy, which of course means electricity is not energy. Indeed the work done in charging a conductor is equal to the electrical energy stored up or lying in that conductor, which, is a quantity of electricity raised to a certain potential.

We can picture water in the bottom of a well as being something that could do work, if it were raised so that it would thus acquire power to do work. We can also see that a mass lying at rest could do work, if it had motion imparted to it. A mass in motion is termed kinetic energy, as a quantity of electricity with a potential is known as electrical energy. Work has to be done to create the kinetic energy of a moving mass, hence a force into space, as being our idea of work, is numerically equal to $\frac{mv^2}{2}$, the formular of Kinetic Energy. It becomes quite clear, that the quantity of matter or mass devoid of motion is not considered as energy, neither should the quantity of electricity without its potential be energy either. If we neglect the adjunct motion in one case, and the potential in the other, we can reach the conclusion that matter and electricity stand for the same thing; or this can be put, that mass and a quantity of electricity are the same, so far as energy is taken into consideration. This amounts to saying, that energy and matter are identical.

If this is a correct conclusion to be derived from Modern Physics, it should have at once suggested itself, that Potentiality and Motion should have received comparative study. To say that a quantity of electricity possessed potentiality would mean in this way that a certain mass had motion. A current of electricity only signifies potentiality exists, precluding that a quantity of electricity could exist without potentiality where there is no current.

And so with Heat, the potentiality of a higher temperature is to be seen in conductivity, and not in radiation. But here coldness is not treated as a different heat, or form of energy, to that of hotness, like with the polarities of electricity.

Light so far as we know only radiates, that is the conductivity of light has not been studied in that it has not been discovered. But seeing that energy is transmutable in the ordinary sense, those three things electricity, heat and light should bear more correlation in nature. Modern physics has striven to do this in the electro-magnetic theory for some time, but without a conclusive success.

The reason of this probably is, that in certain aspects the two polarities of electricity are treated as two distinct things which can amalgamate to form nothing; yet at the same time the electric current is treated as a matter of potentiality possessed by one thing, and one alone. It therefore would be wiser to become clear on this matter, for every critical student deplores the ambiguity.

If a suitable body is electrified by friction, it is considered the energy, treated in terms of works done, imparted disappears, and a quantity of electricity appears on the surface, but only on the condition that another equal quantity has made its appearance simultaneously somewhere else. These two disunited quantities only correspond with the kinetic energy absorbed in friction, in that they possess a difference of potentiality. Which means, if allowed, these two quantities will reunite and produce an equivalent amount of energy to that absorbed in the friction.

Thus the rubber and rubbed will attract each other after separation, if allowed to do so. If allowed, then the total energy absorbed in the rubbing and separation is restored on amalgamation. Which appears to be virtually nothing, in that the restored energy is no longer detectable.

If we had to deal with heat under conduction, after a state of equilibrium has been reached in temperature,

we are still able to find our energy and measure it, but not so with electricity under the above conditions.

To overcome this difficulty of difference of potentiality or polarity, they received the algebraical signs of plus and minus. Therefore it made matters worse, in that it was necessary to deal with a minus quantity of apparently something, which, it is needless to tell the reader, has no meaning. Zero lay between the two potentials.

Finally we are told that the kinetic energy of friction is absorbed and the neutralized electricities appear then to be split up into two things. So according to this the neutralized electricities lying in any body is infinite. That is, as long as we can keep up the rubbing, without detriment to the rubber and substance rubbed, electricity of the active energy type can be produced as long as that action lasts.

But electricity in the shape of an electron has volume and mass; it is for physicists to still explain how an infinite quantity can lie in a finite whole, and it lies with them to agree this with their Conservation of Energy Theory.

There is not the faintest hint as to the reason, why electrified bodies repel and attract each other, nor is there any explanation forth-coming as to why two bodies similarly electrified, but of undoubted different potentialities, still repel each other. For we may positively electrify any number of bodies to different degrees of potentiality yet in spite of that difference they repel each other. Potentiality, in this light, does not appear to be a matter of algebraical signs. This rather forces modern physics to accept the view, that there are really two kinds of electricity, which again gives trouble, in that when both amalgamate, there is nothing at all.

And we are no better off in studying electricity as an electric current. If we try to visualize the same as water following from a higher level to a lower level, we find that such comparison leads to the necessity of seeing the water at the lower level rising up to the

higher level, as the high water makes its descent. That is, a galvanic current has to be considered as a flow of positive electricity in one direction with a concurrent flow of negative electricity in the reversed direction in the same conducting medium. This the Ionization Theory of molecules entails, and unless the negatively charged ions rush past the positive ions, or do something of that sort, the electrolytic current cannot be considered to be an electrolytic action.

Negative and positive electricities will each circulate through a conducting medium precisely similarly to a galvanic current, which is treated, as being opposed currents of different polarity; yet we are told and know that if each opposite type of electricity, if introduced into a conductor at the opposing ends, absolutely neutralize their powers. There may be a misconception of the modern physical interpretation, but it is equally certain that a misconception is justifiable. And more so, in that the negative electron has been weighed and the positive electron has been identified with the element Helium; which surely means physics distinctly recognizes two types of electricity, and has therefore no right to treat potentiality as a minus quantity.

When we introduce magnetical phenomena into the discussion, although we see the close connection between magnetism and electricity we gain nothing. For what magnetism is has never been told us. The idea of molecular magnetons at the most only describes the supposed constitution of a magnetic steel bar; we are not able to handle these units, as has been the case with the electron considered as units of electricity, and consequently we cannot trace out the action of electromagnetism. Every thing again has to be converted into terms of lines of force, and the free electrons of conductivity have to be left out of account.

Any unbiased student of this department of physics is bound to be disappointed with the want of consistency, and though the powers of magnets increase and wane in some correspondence with the electrical forces, their

connection is not understood. In fact, there is not that distinction between electricity and magnetism, as there is even between heat and light; for we are asked to conceive all accelerated electrical charges as accompanied with magnetic effects, and that the two always go together as virtually one form of energy.

When heat disappears and kinetic energy appears in its place, we feel somewhat satisfied that we understand things, which we really do not; but a stationery magnet produces no electrical effects, any more than a stationary electric charge is incapable of inducing magnetism; yet either of them at rest are active in that by induction we learn such is so.

The theory of force lines alone satisfies the physicist in electricity and magnetism, but at the expense of the theory of point charge or the electronic view of this subject; yet neither account for induction. For it is not enough to say there is a line of magnetic force, more is required to explain why particles of iron are magnetised when lying in that line, thus shewing constant polarity. It must always appear strange, that though the line from the end of a magnet divert and curve outwards, any iron particle attracted in its motion pays no attention to the nature of these lines, but flies straight on end towards the magnet. The same remarks apply to the tubes of strain lying between two electrically charged bodies. So that it can be said, until that we know why electrically charged and magnetised bodies move under their respective influence, we are a long way from knowing the nature of electricity and magnetism as forms of energy. And so with Gravity, as long as action-at-a-distance is accepted, we shall be deflecting hypothetical lines of force and imagining the rest.

Empyric rules are not theories. Action-at-a-distance is empyric in sense: Newton's theory of gravitation is not a theory in that it does not explain the falling stone's motion in the same way as the motion of bodies under other conditions is explained. The wave theory of light is a theory, in that the motion of light is explained by

the agency of aether; and by utilizing aether physicists had hoped to give a common explanation of derived motion throughout the universe. But they failed; and now they are looking elsewhere for it in lines of force and have even reached the stage of tubes of energy; and since the manifestations of electricity and magnetism are mainly seen in motion, the reader I think will agree with me, that there can only be one explanation of motion which must be universally applicable. And apparently until this is found, it is practically useless formulating theory on theory, when each in turn neglects the obvious.

The kinetic molecular theory of the constitution of matter originally thought out with a view of explaining pressure of fluids, as has been shewn in an earlier chapter, differentiated between the bottom pressure or weight of a solid and the intrinsic pressure of a fluid; which in turn had to be distinguished from the weight of a fluid. The molecules constituting matter were conceived as spheres, but there was no sanction for this except that liquids could occasionally assume a spherical shape. Originally the electronic theory of the constitution of the atom was not entertained, but it must be included now in the discussion in that this chapter is dealing with modern theories as we find them.

Consequently as the atom is a constellation and thus virtually a "dynamical" sphere, we can at once proceed to peep into the anatomy of the molecule; and to keep this spherical, we are obliged to carry into it the constellationary structure of the atom. But this is not done, in that dynamical spheres did not lend themselves for an architecture of solidity. So that if the kinetic theory was to apply to solids as well as fluids, the theorists had to rely on atomic vibrations, and not on the rectilinear motions of the molecules. Only in this way was the characteristic vibration frequency of each atom independant of heat, which merely increased the amplitude or diminished it according to whether a rise or fall of temperature took place. And if the vibration amplitude became excessive, the atoms of contiguous molecules came in contact and the solid thus liquified.

The critical reader will undoubtedly want a better explanation than that, yet this is what modern physics supplies us with.

The molecule in the solid has no rectilinear motion. And we are therefore asked to see, that this rectilinear molecular motion is really derived from its constituent atoms vibrating so intensely, that it is possible to take some of that kinetic energy and collect it into some straightforward motion of the molecule. I am incapable of thinking this out, much less devise the inner mechanism of a number of balls, which remain intact as molecules, but suddenly fly about in straight lines because they are supplied with heat, which has agitated the smaller included balls or constellations unduly.

Is this Science? If not, then such should have never appeared in a scientific book. If the idea was fascinating it should have been bound under another cover.

But we have to find out, before we can move any further in the matter, from where the molecules of a fluid derive their rectilinear motion. A molecule of oxygen free in space would travel 18 miles in a minute, and other molecules of other bodies would have velocities inversely proportionate to the squares of their densities.

We have therefore to picture a sphere containing numerous atomic constellations held together by forces, (which we need not enquire into at present), moving in a straight line with a considerable velocity, endowing it therefore with a definite amount of kinetic energy, which is going to be used later on in a confined space for producing a constant pressure, and thereby be converted into a potential-energy-concern.

We are not told what decides the direction of this molecular rectilinear motion, and the gravitational law of attraction is conveniently left out, as if not in action. Apparently such would interfere with any sustained rectilinear motion of the individual molecules, at least such can be presumed.

Even if we accept this motion of the molecules as being the nature of gas molecules, we have still to learn

as to how this motion disappears on solidification. The answer could be, that at absolute zero temperature, there would be no rectilinear motion of the molecules of gas; but this would tend to identify heat with the kinetic energy of the molecules, and this in turn would be inconsistent with the wave theory of heat and light. So the reader can see that the working out of the Kinetic Theory is neither simple nor are the results clear. Even the rising current of a heated gas or liquid cannot be accounted for by this molecular motion. Increased rectilinear motion by heating a portion of the gas would be finally equilibrated in all directions. But the fact that the hot gas rises shews that the increased molecular mobility rises too, therefore it is not equilibrated in all directions.

Again it is very doubtful, whether we are right in assuming that the probabilities of molecules of a gas taking all directions of motion, so as to bring about equidistribution of directions of motions is correct. For instance in the sublimation of Iodine, the molecules of iodine in the solid must somehow or other be impressed with rectilinear motion, and these are conducted into a vacuum. It certainly does not follow that the molecules leaving the solid as a vapour would strike out in all directions. Certainly none would restrike the body downwards at the start, and this only after having rebounded from the top and sides of the vessel enclosing all. The theory entirely lies on chances coupled with the profusion of quickly moving particles.

If the vacuum were a very long tube and narrow, some molecules would reach the end before the others, and it appears it would take a measurable time to get the molecules all bombarding the sides and end with direct blows at right angles to the inner surface. Experiments on the time pressure takes to establish itself would be of use on this point. The theory to my mind is too fanciful in this respect and I should think it worth working out in studying diminishing pressure, by evacuating the vessel against the fast diminishing number of molecules in the vessel. One, some what, imagines a

vacuum tube would shew varying intensities of pressure in different parts, if the theory is correct.

However the theory breaks up in the diffusion of gases. Leaving aside the attraction of the molecules between themselves, which has been done, we cannot omit taking into account the attraction towards the earth, in that every gas possesses weight of some sort. This is rather difficult to see how these molecules flying upwards and side ways can shew any weight; for even the down going ones are reserved for the internal pressure.—One can safely ask what weighs? And the answer becomes more difficult, if we bear in mind that the interdiffusion of gases must absorb energy. As long as we are dealing with molecules of the same density no absorption of energy is necessary, provided the molecules of the vessel, and the molecules of the gas are “perfectly” elastic. But it is quite another matter, if we have to drive a light gas, like hydrogen, downwards into a heavy gas like bromine, which has to be driven also in part upwards. The absorbed energy can only come from the rectilinear motion of the molecules; and if these are reduced not only would the pressure diminish, but the temperature would like wise. No experiments, to shew such to be the case, are brought forward in support of the theory and apparently none are forthcoming.

Again the kinetic theory, which is based on rectilinear velocities of the molecules inversely proportionate to the square root of the densities, cannot explain the almost instantaneous diffusion of all gases into a vacuum. There is only the pressure of the gas available for the propulsion of the molecules, and this pressure according to that theory is but a definite rectilinear motion for any particular molecule. A heavy gas should reach the end of a long tube under vacuum appreciably in a longer time, than the light gases; but so far as can be gathered from the literature on that subject, such diffusion shews no irregularity. It is called in that case *Mass Action*.

Generally it is known that the inter-diffusion of gases is not affected by change of pressure, and strangely the

viscosity of gases increases with a rise of temperature, yet is independent of the pressure.

Since the molecules are supposed generally to be of one size, no matter which gaseous substance is dealt with, and the densities of the molecules or compounded atoms vary with the atomic weights, apparently the molecules of one gas can be considered as being interspaced directly in proportion to the pressure. There seems no reason, why pressure on reducing the interspacing should increase the velocities of the molecules; and as a matter of fact as mentioned above, diffusion does not recognize difference of pressure within limits, yet we are quite certain heat is produced by pressure. And previously we learnt, that heat increased the velocities to account for the increase of pressure, which is supported by thermal effusion, where the velocity is inversely proportionate to the square root of the absolute temperature. We are therefore bound to believe, that pressure increases the velocities apart from reducing the interspacing, which is a direct contrary conclusion arrived at from experiments made on the interdiffusion of gases at different pressures.

I have tried to put the matter as fairly as possible in order that the readers may judge on this matter. For I feel it has been a grave error in omitting taking molecular mass attraction into account, especially in that Laplace would increase this force of attraction between molecules, when very close together, to explain capillarity. And I think, if physicists go over this matter again they will agree with me, that mutual mass attraction, in the light it is viewed by them, means the molecules of every gas would tend to coalesce in time, if no outside energy were supplied to keep them apart; for we are not dealing with a dynamical equilibrium in this case like unto the electronic constellations.

And so with electrolytic action, where ostensibly their molecules move in the nature of hypothetical ions. In this way we get an explanation of the mechanical conductivity of electricity, entirely different to that derived from the electronic theory. In the latter the atoms disin-

tegrate apparently momentarily, and the freed negative charges, termed electrons, pass as it were from atom to atom along the conductor, but the reversed movement of the positive nucleus is not properly dealt with. In electrolytic conductivity all ions carry the same intensity of electric charge, hence their mobilities must vary; the atoms and their electrons do not participate in the action. When the principles of ionisation are applied to the diffusion of liquids, since the ions apparently in that case travel with equal velocities, we have to assume that they are electro-statically associated; and assumptions have to be made, that the masses of certain molecules are increased by a process of hydration, which accounts for the migration velocities being abnormal to the calculations of expectation.

Conductivity of electricity in electrolytes examined in this way appears decidedly different to the conductivity in an ordinary metallic conductor or wire.

The transference of electric charges in electrolytic action necessitates dividing the ordinary kinetic molecule into sub-molecules or ions, and as long as there are a string of these lying between the two electrodes a current of electricity will pass. This of course is not compatible with the rectilinear motion of the molecules of the Kinetic Theory, which stipulates that a liquid is a liquid due to molecular mobility. And as the ions become abstracted, as it were, at each electrode, no provision is made for renewal of ions to take their place; for the electrolytic solution is by no means completely ionised prior to the passage of the current.

The existence of two particles of matter differently electrified in conjugation is opposed to all electro-statical experience. One could believe that owing to an electric current the charges could be kept separate in the same way as it is possible to believe the polarities of the numerous magnetons in a bar of iron are kept separate by magnetic induction. But it is otherwise. The separated charges in ionisation determines the electric current, or in other words the current does not produce ionisation.

With gases however we learn that ionisation is produced by the emission of electrons (negative) with the cathode rays; but with liquids ionisation appears to belong to its nature of composition. A non conducting liquid possesses no ions, that is its molecules are not lying in conjugation with opposite charges in separation.

With all the foregoing nothing suggests itself, as to what the molecule can really be. Physicists are not in favor of giving up the electronic constitution of atoms, for one main reason which is, they see that only by such means can they bring forward a seemingly reasonable explanation of radio-activity. By disintegrating the atom into free electrons possessing enormous kinetic energy, it is possible to shew at least the direction from where energy is derived, which otherwise would have to be accepted as spontaneously generated, in disagreement with the principles of conservation of energy. They have not a store house of energy to draw from, which our theory has identified with a gravitational field, and they cannot as yet expugn the idea of conservation of energy. Indeed any gain of energy shewn in Radio-activity experiments is booked down to, what is termed, "internal atomic energy," apparently collected in some way or other from an atom, that has been exploded by an internal force, without an origin or even a name.

So far as the elements are concerned the deflection of the X-rays pointed to a molecular resolution and considerable headway was made in deriving the atomic numbers of the elements. But there remained exceptions, which shewed inconsistency still existed. The molecule of the compound of Na Cl and other substances were not amenable to the X-ray rules for all molecular elements. This led to constructing the molecule of Na Cl as a cube in place of the spherical form, and by placing the composing different atoms in definite positions in that cube, the result became amenable to the X-ray rule. But they neglected the fact, that in that Molecule the number of atoms of Sodium and Chlorine did not correspond, which we know cannot be the case so far as the atomic theory is

applied in chemistry. The cubical molecule of Na Cl in that particular instance carried 13 of one and 14 of the other. At least this is as I count them.

Then again chemists speak very loosely of chemical energy, as if it were another form like heat, light or electricity. Yet in their inner hearts they cannot reconcile this contention, for each element in that way appears to possess a special energy different from those of other elements. The heat absorbed or given out in chemical combination bespeak to this quite clearly.

Explosions are hardly discussed at all; and yet this violent ebullition of energy should have received first and the greater consideration on that account. The action of catalysm is only graphically suggested by formulae; its nature is hardly touched upon. Surely the explosive violence of disassociation as with fulminates, and the explosive violence of combination as with gunpowder are worthy of the deepest comparative study. The similarity of the physical effects demand a similar explanation, which chemistry cannot supply with its atoms and molecules as they are accepted in modern Science.

The emission of negative electrons from substances on which the ultra-violet rays of light are allowed to fall viewed in the Conservation of Energy light, would mean that light energy, is transformed thereby into free electrical energy; but these ultra-violet rays have the power of discharging a negative electrified body, without any effect on a positively charged body. The latter fact rather tends to shew that the ultra-violet rays are not converted into negative electrons; for if they were, they would neutralise the positive charge of the positively electrified body. Consequently the other alternative is that the ultra-violet rays somehow or other liberate the negative electrons, much in the same way as a body can be electrified by friction. The difficulty, so far in that case, lies with the source of these free negative electrons, in that the atoms containing such do not disintegrate, as is considered to be the case in radio-activity. We therefore come to that point which necessitates again assuming, that the sub-

stance contains an infinite amount of that neutralized electricity which is ever ready to be disassociated into its two polar forms. And so with ionisation, the appearance of the two polar forms in a liquid seem to have no derivation. Even with a gas into which a cathode charge is introduced the formation of polar ions out of neutral molecules still awaits explanation.

Chapter VIII.

Force in the Reality.

Force is so closely associated with Motion, that there was considerable difficulty in dealing with Motion alone in that chapter. The idea however was to shew on analysis of the manifestation of motion, that the process of converting zero into a value by insensible degrees or steps could not be conceivably possible; and from that fact it was necessary to fundamentally alter the idea of identity of matter. It was agreed that motion was built on the idea of change of position having a temporal function, but when the quantity of change from no quantity was entertained, the idea of motion as a continuum had to disappear.

Therefore, the only common factor of motion in the manifestation and the Reality was change of position with a loss of continuous identity. This is rather as it should be, in that our thoughts are detached from each other, and certainly knowledge remembered is decidedly detached from a consciousness of the present. Thus identity based on knowledge of the past necessarily must be a discontinuous idea, whichever way one looks at it.

Force as a continuum shews the same weakness, in that when out of action it somehow disappears into nothing, to reappear suddenly as something that can be quantitatively estimated. The body at rest gave no idea of force being existent, but as soon as another outside force came on the scene, the force of Inertia immediately sprang into existence. This, to me, has always appeared as an act of creation and should have received attention ere this. But as long as Force and Motion were untangible, therefore not like the body itself which shewed force and motion, it probably never came into the mind, that their nature would have some day to be investigated. No wonder then, that even up to this day there is sometimes a tendency to confuse Force and Energy; and it

may be said when mass was discovered in Matter, only then Force was differentiated from Energy. The hypothetical Mass of to-day stands to Matter much as the hypothetical Force is related to Energy.

The idea of confusing Energy with Matter has always been held to be absurd till quite recent times. This should not have been so, in that Force attendant on Energy was only known in terms of Mass—an extraction of Matter. Uptill then energy was only seen in moving matter, it was chemical knowledge that instituted the idea that energy could lay in matter without motion. This potential energy thus became a something always in existence in a definite quantity, which eventually led to the empirical law of the Conservation of Energy. But force and motion, even up to this date, have no home: Like ghosts they need none, in that they seemingly appear and disappear in an accommodating way.

The action of gravity at a distance insisted upon keeping Force as something worth housing, hence that great enunciation made by Newton, that mass and mass have an attractive force lying in themselves; or put in other words, it is the nature of matter to attract itself.

Motion having always been in dispute with Force in the matter of priority was naturally jealous of Force having been provided with a residence in the gravitational field of Matter. She appealed with the result, that she also could be provided for, even far more substantially in that she was able to gyrate in every atom of matter and enjoy full freedom in the all-pervading Aether. Naturally she and Force met again, but there was no improvement in their relationship for they still disputed the old subject of priority.

By identifying matter and energy the dispute between motion and force can be decided in favour of the latter; and this has been done in seeing that insistance of reappearance of spacial matter is force, and that motion entirely depends upon the position in space the reappearance takes place. Thus, whether the spacial unit represents energy or matter, its insistance of reappearance

is force, and the manifestation of motion is simply derived from those conditions. In this way it can be seen, that force as Insistance is ever in evidence, even if not in action; thus a mass of matter at rest is a force in itself, just as much as a moving mass is. This is as it should be, in that Inertia of Mass at rest cannot be distinguished from Inertia of Motion, otherwise termed Momentum in that both exhibit force.

This now gives us a much clearer understanding in respect of "force of matter" at rest. Uptill now we only knew in modern physics, that force was mass into the acceleration produced by it; and mass on the other hand could only be expressed in terms of a force measured by its motion of acceleration. If there were no motion of acceleration, it was difficult, if not impossible, to define mass in terms of force; hence another hypothetical, Inertia, had to be introduced which was considered as the nature of mass. An accommodating nature, like gravity, which got over the difficulty or necessity of locating a form of energy which could not be recognised properly, but which, inwardly, every physicist knew existed somewhere. But the time was bound to come calling upon the solution of these incongruities.

Physicists experienced little difficulty in correlating electric or magnetic action-at-distance forces with all other forces derived from the various forms of energies seemingly resident in Matter, but Gravity would not submit to this arrangement. Amongst many people this puzzled Einstein, and I have little doubt that this irregularity of Gravity lay in the back of his mind as he evolved the theory of Relativity, which was only a means to an end; and the latter was, that Gravity must be co-ordinated with the other energies, so greatly studied. Unfortunately, Einstein placed too much faith in Motion, which he carried into the Reality and was, no doubt, annoyed that Force naturally insisted upon coming with it. This, as far as I can make out, rendered it suitable to introduce the effect of Space-time, which undoubtedly was discovered in mathematics ready-made; but even

with all the vehemence with which it has been introduced, it will never be a conception, or never can become a conception by such means.

We took the obvious line; and in considering that the force of gravity could do the same work, that could be done through the agency of other energies—naturally having identified Energy and Matter,—Gravity with us became Matter, and its insistence of reappearance was a force on exactly similar lines as with all other manifestations of force.

The reader will thus see, that though the present mode of thinking entails a disagreeable feeling in respect of the force of gravity being associated with a long-desired Gravitational Energy, we have no difficulty in discriminating between the two. And we gain immensely in being able to give to Kinetic Energy a meaning on the same terms as has been given to all other energies like Heat, Light, Electricity and Magnetism, and we can include the Energy of Life as another variety which Science up to date has been unable to do. With us, wherever Energy is to be found, we see spacial matter interexisting, and when interference takes place, we see the force in action; but we get this advantage that the latter does not disappear, when not required.

The idea has been, that all forms of energy in the reality are virtually Kinetic Energy of mass; hence the Kinetic Molecular theory; but the introduction of this idea of Energy gave Aether a molecular structure which naturally entailed that Aether possessed mass. Then came the difficulty of deciding, whether this molecular system of Aether moved in mass or was all-pervading and stationary. Experiments had to force on to scientists the belief of its mobility being true and again we got something that accommodated the terrestrial observer. Einstein finally got rid of it, but at the expense of Space and Time.

The resistance we experience in kicking a stone is now going to be given in terms of electro-magnetics units, which apparently means or eventually must mean that matter and energy are delusions and another delusion is

going to be substituted, where Force and Motion are going to reign supreme with nothing to move, that is, mass becomes a force in motion.

Of course, everybody is anxiously awaiting this development, but I thought in the meantime it might be just as well to regain temporary consciousness and try something else, before taking farewell of the obvious.

The mistake is not in the elaborations, but the root cause of all these diversified theories not assimilating lies in mistaken fundamentals. This has been dealt with in the chapter on Modern Theories to a certain extent.

It may be painful to some readers, if elementary physics undergoes analysis, but unless this is done the foregoing will lack conclusiveness. I now propose to wade through essential elements and discover the source of error.

Ordinarily Force is treated as that, which can do work. Everybody should know what doing work means. A strong man can do more work than an invalid, though the ambition in that direction may stand on equal terms. We thus associate the work done with the man doing it, and we recognize that the man's resources of energy diminish in time; and though the final effort may exhibit the most intense force, apparently loss of energy entails a diminution of force in time. A man can be doing work in merely pressing an immovable body. The pressure exhibited is force without the production of motion, but though the table is undoubtedly pressing similarly against the pressure of the man, no one dreams of stating that the table is doing work. If the table moved owing to pressure, the man would be still doing work, but here we see Force producing Kinetic Energy. Naturally, it is asked, that since the force produced by the man remains in character the same, whether the table moves or not, when it does not, where does the energy of the man go to, seeing there is no transference possible into a kinetic energy of the table?

If a weight, which is clearly a constant force, is put on the table, there is no sign of any work being done, but

as soon as the weight bends or breaks the table, the work done can be measured.

Putting the two above examples on a similar basis, it is fair and reasonable to suppose that the body weighing on the table is like the man supplied with energy to be able to produce the force of weight; and, further, if the man is doing work in pressing the stationary table, the body weighing on the table is also doing work. But physics disallow both these contentions. The solution of this incongruity lies in the fact, that the man in pressing the table reduces the weight or force with which he is pressing the ground, and, obviously, if he put his whole weight on the table by standing on it, he would be doing no work under those conditions of standing; in fact he could lean on the table without loss of energy. Clearly, the work done by the man is not done on the table, but is done within his bodily frame, and thus it appears that the work done lies in the distribution of the force—his weight. This, in the words of this theory of interistence, means the interference of insistances is under constantly changing conditions, which is Work

The weight which is constantly pressing the table as constantly as the table is upholding the weight, though there is a manifestation of force in action, there is no exhibition of work being done. That is, though the body is supplied with a constant recurring quantity of gravity matter which is constantly interfering with the insistance of reappearance of the body (the weight), exhibiting thereby a constant force or weight, the table is likewise constantly insisting on its reappearance at rest, through the constant insistance of stability of the earth on which it rests. Cohesion being nothing else but united insistance of reappearance of all the units composing a solid due to co-ordination of position. To be dealt with in a later chapter.

Modern physics cannot solve this incongruity for, in the first place, it has not defined Vital-energy, nor the Will of man; and, in the second place, it has confounded Work Done with Energy; for there can be no question that

Kinetic Energy is denoted by $\frac{mv^2}{2}$, and this is equivalent to Fs , (force into distance of action,) which is Work Done.

We now come to another incongruity. The rotating disc having once received its kinetic energy will rotate for ever provided all friction or opposing forces are eliminated. This means there is no loss of energy in work being done, that is no work is being done: yet we know that some force is constantly deviating each particle of the disc from taking on translatory movement in a uniform straight direction. We also are taught, that the moon is deviated constantly by the mutual force of attraction between the earth and itself, yet there are no signs of work being done, that is, there is no evidence that the system is supplied with energy to make up the loss due to the imagined work done by the force of gravity deflecting the moon against its momentum; and we can add that no work is done by the earth, when a stone falls freely downwards, if we neglect the work done against the friction of the air.

We can now anticipate the reply to the latter incongruity. It will be held that the force of gravity, acting through the distance the stone fell, has produced an amount of kinetic energy equivalent to $\frac{mv^2}{2}$, which is equal to the force into that distance; which is the measure of work done. We admit that, but we do not see that any work has been done. Had the stone been influenced by another force in a contrary direction, undoubtedly work would have been done against this gravity force, and the kinetic energy produced would have been less. Stress might be laid on the fact, that the gravity force was opposed by the inertia of the stone, which undoubtedly is in itself a force when asked to be so; but I do not think this will be seriously contended, for there is the example of kinetic energy being produced by impact, and the distance of the force traversed during impact has to be dealt with. But with regard to the case of acceleration towards the

centre, as seen with the moon tracing its orbit around the earth, we have a force acting absolutely at right angles to a natural straight-line motion entailed by the original momentum of the moon, and not in any way in line with its direction which would mean that the Kinetic Energy of the moon would increase in time. This, of course, cannot be the case. This constant employment of the force of gravity without producing increase of kinetic energy of the moon, and certainly not absorbing any energy, must always stand out as anomalous; and further difficulty is experienced when we neglect the forces and only study the motion, when we find that to convert straight motion into curvilinear brings us in conflict with the fundamental conception, that zero cannot be converted into something without addition.

Thus we see that by confusing energy with work done in the formula $Fs. = \frac{mv^2}{2}$, it is liable to lead us into error in judging whether work is being done or not; and if we throw out the criterion of work-done, the human man would be at a loss to understand the significance of force in relation to energy. Force in physics, therefore, can act through a distance on a body without producing work, and it is hence irregular and misleading to define work done as force into distance as invariable. And further, it is or can become a danger, when energy and work done are loosely confused in speech, though possibly not in thought.

This investigation of elementary physics indicates the incongruities arise from a mistaken conception of the fundamentals. If we clear ourselves by seeing that whatever moves through space must occupy space, thus identifying Energy and Matter as being of one substance, we will be prepared to know what work done is in the Reality, having decided that Force is ever present as the insistence of reappearance of our spacial unit, and motion simply means changed position in reappearance. Then can we see, how more and more added spacial matter in any system can bring about, indeed does bring about, the

wonderful action of Force which can conduct the work it is called upon to do; and in greater vividness we can at length see what the origin of vital strength and activity is. Take away the supply of these vital units and life ceases, and all its manifestations and organic response, so little studied, pass away. It is not a matter that physical force is lost, for such is common to all matter and energy, but it is a matter of greater importance to us that the vital spacial units fail us. Compare these conditions with a steam engine, cut off the heat spacial units and throw in Light, Electricity, the engine no longer will exhibit its functions; and so with living organisms food, heat and light are of no avail to support the functions, since response disappears with the vital units. This is fully dealt with in the chapter on Life.

We can now be quite clear as to what work-done really is; it requires a supply of spacial units to bring about interference of insistance of the units of the system and only so long as these conditions vary, is work being done. On the other hand if the state of interference of insistance is not altered, no work is being done; and thirdly if there is no interference at all though force is ever present, it is not in action. We thus give a reasonable explanation of Inertia, in that it is a force but not in action, and only becomes so as soon as extraneous spacial units like gravity and matter interfere with the insistance of reappearance of the spacial units forming the system, which is manifested to us as mass possessing inertia. Gravity becomes Energy, and there is no need or possibility of identifying Inertia with Gravity which is at present I think in Einstein's mind. Inertia is insistance and Gravity is Matter, and the digestion of even mathematics, I somehow feel sure, will not convert one into the other. However, it is extremely interesting to watch the attempts of those who will introduce the illusory manifestations of motion and force as they are into the Reality, in that such is educating us to be extremely careful in adhering rigorously to one set of principles of thought and not adopt the process which

permits one theory to invoke another *ad infinitum*;—which sounds so much like a workman ever grumbling at his tools.

We can now deal with what may be termed the distribution of forces. Ordinarily a force is considered as something unified, possibly only for convenience in tracing the action of really innumerable smaller forces, which are quantitatively summed up into a solitary force. The number of quanta forming a united force is merely fixed as a matter for convenience and is quite arbitrary. Strictly speaking in the Reality, there must be an insistance for each spacial unit; and since insistance is force, this theory definitely will lay down the number of such units as soon as measurements can be arrived at. The reader can now see how force can come into action by true quantitative, though minute, increments; and having realized this, the awkwardness of developing zero into something is not experienced.

It is, however, not the purpose of this chapter to deal with the co-ordination of units forming a system, as this wants very careful treatment in a further chapter on Cohesion, but we are obliged to state that the co-ordination of units will be the basis of cohesion in solids and viscosity of fluids. So, if we have a mass of units intersisting in co-ordination, we have what may be termed dense spacial matter. It stands to reason that any interference of the insistance of one unit should effect all other units in co-ordination, but on consideration the abstraction of an outer occurring unit should not affect the united instances of all the other innumerable units; but as this is trespassing on the chemistry domain, and the theory of Polishing, it is better to confine ourselves to those instances of multiple action. A sharp point, sharply applied, will pierce another body, even if the point and the body are of the same substance; this in the Reality means that the interference of intersistence is only local; if the point is blunted and pressure is applied, the instances of reappearance of units on both sides is transmitted to all the

co-ordinated units of each system. The state of co-ordination entirely controls the distribution of the insistance of the units.

If we take the beam of a balance, we find that at one moment it can be supported in the centre in a poised posture and at another moment it can be supported at both its ends: clearly the force of gravity in the first case is concentrated at the centre and in the second case is distributed at the ends in definite proportions. Physics should have explained this peculiar power of substance, but all text-books are silent on this matter. It is taken for granted that no explanation is required and the subject of Statics is forthwith proceeded with, and thus this distribution and concentration of forces is considered of instantaneous effect, in that Statics does not recognize Time. Consideration will shew, that it must take time and the period will be proportional to the number of units through which the transmission of insistance has to be passed. Thus, the blow of a hammer on a short bar in effect at the other end is carried out more quickly, than would be the case with a long bar. The time of impact is measurable, which means that the effect and impact are not by any means instantaneous.

The shape of a solid absolutely defines this transmission of insistance; had we taken a fluid, we would find that the pressure at one point is distributed throughout the mass of the liquid, shewing no signs of concentration as was the case with a solid. This does not shew that the co-ordination is different as might be expected, but demonstrates to us that the units of a liquid or gas must be intersisting in co-ordinated new positions.

It can be readily seen that an imaginary sphere can contain any unit intersisting in one position with an ever-changing posture; this has been termed the sphere of co-ordination, and thus any system shewing cohesion can be looked upon as a mass of these spheres of co-ordination the centres of which are fixed relatively to each other; with a fluid these spheres, put briefly, are not fixed relatively to each other, consequently the transmission

of insistance, in such a distribution, must appear in all directions and necessarily would take a longer time to be effected than would be the case with those spheres fixed relatively to each other. This can be roughly visualised if we took a pile of cubes for the solid and a pile of spheres for the fluid as an illustration. The square cubes would have a more permanent orientation, than the spheres ; and any disturbance at one part would receive distribution on dissimilar lines for each pile. Rounded sand grains behave more like a fluid, than sharp-edged grains.

As said before, modern physics offers no explanation in respect of the distribution and concentration of forces, we at least have some conception of the Reality of such being undoubtedly associated with the manifestation of Cohesion and Viscosity. A brickwall forms a more cohesive structure, if the bricks are uniformly made and laid ; imitation therefore seems essential. If this analogy be extended to men, as with soldiers, imitation is essential for cohesion and united action ; here there is no mortar to bind the units, but the force of imitation common to all is significant of co-ordination. I admit this is a far-fetched analogy, but we have had it suggested to us in the Introduction that Insistance of Reappearance of a unit was comparable to Will, and as will be shewn later on that analogy carries with it much truth ; so that if we take the Power of Imitation in nature as representing the conditions of distribution of forces, I do not think we will be far wrong. Nature works its imitation so consistently and universally and one feels she could not do otherwise, but beyond that we have no explanation other than the empirical enunciation that such is the nature of things.

If we cast back over these pages, we will find that we have been fairly consistent in all our estimation of the probabilities of the resolution of the manifestations of force into the Reality. We will find that useful advance has been made in our recognition of what force really is, which not only prevents us at times in confusing it with energy, but it emphatically states force is always in existence. Thus Inertia got a satisfactory meaning

consistent with what we did expect, and finally it must be a matter of great satisfaction to know, what we always inwardly suspected, that work-done could never be Energy.

I do not think that modern physics can point to such a clean record in dealing with Force, Motion and Matter, nor do I think that Plank's Quantum Theory has the universal applicability compared to that of our units of insistence of reappearance. We certainly get rid of that obnoxious term of Potential Force ;—a contradiction in meaning.

Chapter IX

Weight and Pressure.

Weight and Pressure under the modern system are both forces therefore necessarily measured in terms of mass, but they suffer this advantage in not being identifiable; hence the Hydrostatic Pressure Paradox, where the bottom pressure of a liquid need not necessarily correspond with the weight of the liquid. On the other hand, the weight and bottom pressure of a solid are identifiable and correspond, and thus equal each other.

This inconsistency naturally puzzles the student at first, in that he clearly sees that the weight of a column of water increases with its height, and he further learns that the liquid pressure at the bottom is greater than that at the top; seemingly corresponding with the weight. Thus the side and bottom liquid pressures appear to him to be derived from the force of gravity, which he has accepted as producing the weight. And I do not see that he can be blamed in this matter.

For enlightenment he has the Kinetic Molecular Theory thrust on him; and judging from its almost universal acceptance, the student cannot be blamed if he now says, "I see, it must be so." I said the same myself at one time.

We will now apply this molecular theory to a gas, in that it is not drawing much on the imagination to believe heat is molecular motion of a gas. It is somehow easier to step down from vibrating aether to a trembling gas than to a liquid. The molecules are supposed to be perfectly elastic and to be spheres of about the same size. A later idea is that they pulsate, this is not taken into account. We will not confuse issues with the electronic atomic-compounded molecule for the present, nor bring in the effect of electrically charged ions; that is we will, as they have done, deal with a molecule as a perfectly elastic ball without a skin.

Since a gas (here be it noted such does not apply to a liquid) approximately continues diminishing in volume a definite fraction for every degree of reduced temperature, it is held that there is an absolute zero, which means there is no heat energy at all. The molecules of a gas in that state are said to be quiescent, and the introduction of heat converts them into a chaotic system of moving molecules. We must leave out the idea, that the molecules would attract each other in obedience to the law of mass attraction, in that with a gas we get no signs of a tendency to coalesce. There can be no doubt however, that this apparent inaction of attraction, can be mathematically explained away. But I do not think it has been done.

Now this chaotic motion results in innumerable collisions between the molecules themselves, but being perfectly elastic (it is a pity we do not know whether they have a skin or not) the total kinetic energy is on an average in a state of equilibrium: that is what one molecule gains the other loses, and so forth; and the same remarks apply to the sides of the vessel containing the gas, which of course must be a closed vessel. Of course the molecules of, say, the glass vessel do not move on impact as much as the gas molecules, but they must be also considered as being perfectly elastic and vibrating synchronically with all the rest in response to the temperature. This chaotic bombardment is the pressure of the gas, that is the innumerable quanta of momentum is the force distributed throughout the gas.

We are therefore asked to believe, that the molecules of the glass are perfectly elastic, but the glass itself is not perfectly elastic. One might as well be asked to believe, that repeated doses of sugar are not sweet, or better put, sugar in bulk loses some of its sweetness.

Upholders of this theory have suggested, that this incongruity can be dispelled by assuming, that some of the molecules of the glass are inelastic and some are perfectly elastic; but this is asking us to conceive a chaotic jumble selecting perfectly elastic points of attack. Possi-

bly they will quote probabilities; but we can do the same in saying there is a probable chance, that, at sometime or other, there might be a combined attack against one part of the glass, resulting possibly in fracture.

So far then, it must be admitted that this explanation of pressure is very ingenious and the conception of such a reality is simple indeed, but it lays down hard and fast rules as to the nature of heat; and seemingly insists, that all dynamic forces are molecular bombardments, since one pressure cannot be distinguished from another pressure. But when we introduce this bombardment theory in explanation of weight pressure, astounding difficulties arise, quite sufficient to upset the Kinetic Molecular Theory as a whole.

Conceivably, we cannot have a molecule undergoing a particular movement which is heat, and at the same time conceive that molecule possessing another movement, say, producing the pressure of weight. Motion has only one condition and that is change of position. But we are asked to believe pressure to be due to these innumerable molecular bombardments between the body pressing and the body pressed. This means that the intensity of the force of pressure is determined by the kinetic energy of the molecules in collision. Adhering to this view, we naturally see, that the force exerted by a weight lying on a table must also be construed as a surface through which mutual bombardment is taking place. It must be evident to the reader, that if these movements of the molecules are heat, as made out to be so in the case of a gas, the temperature determines the weight; that is if the kinetic energy of the molecules is increased, the pressure due to bombardment must also increase and therefore the weight pressure on the table. This, of course, we know is not the case. Therefore we cannot, as it is stated, accept the pressure even of gas as being due to the kinetic activity of the molecules derived from added thermal energy.

Candidly, I do not know how to solve the problem for them; and I have asked, that if the gas is a system of

discrete molecules and they are in motion engaged in producing the internal pressure in the vessel containing them, "what weighs?" The gas undoubtedly does; even if it is of less density than the air, and it can press down the pan of a balance like any other material substance, otherwise termed ponderable matter.

It, therefore, appears to be a mistake in identifying the kinetic energy of the molecules with heat in the first instance, and seemingly it is another mistake to believe the molecules are moving, as made out to be; in that it is entailed, that the molecules of a solid are behaving likewise; which after all has never been seen to be so, and has only received support by indirect and very weak proof.

This molecular activity of molecules composed into a cohesive system as a solid is beyond my conception, and I think such is the same for most people. But it is always being forced on us. Even the molecular magnets, which are supposed to cohere and form an apparently rigid steel magnet, are made to rotate in obedience to the variations of the intensity of the magnetic force. I suppose some day we will be asked to believe that the molecules, which go to form a copper wire in electric circuit, are moving with lightning speed. We will omit mention of the gyrating electrons of the atom only in that an atom is not a molecule—a very useful distinction for postponing elucidation of a difficult point.

It is easier to see how the pressure of a gas can be increased by the insertion of heat, which really means we have increased the volume of a gas. This way of viewing heat receives support from experiments made with solutions of salt, where it has been found that the heated portion of any solution contains a less percentage of salt, than the average percentage of salt in the uniform solution under uniform temperature. This view of heat, which thus accounts for pressure, allows of us conceiving that the gas can be weighed with the heat inserted and as the heat is imponderable, in that the spacial gravity units do not interfere with their intersistence as is the

case with dense units, the weight of the gas is not altered by any heat that may be inserted or be abstracted.

But we have seen before, on the basis of kinetic activity of the molecules identified with heat, that at absolute zero a gas could have no pressure, in that the bombardments have ceased. Under our theory the constant intersistence of spacial gravity in the gas system entails pressure, and thereby we see that the origin of that force is derived from the insertion of the gravity units into the gas, just as pressure was increased by the insertion of heat units.

Here then we have reached a result always expected, namely, that hydrostatic pressure and gravity were associated; in that the bottom pressure of a gas or liquid is always greater than the pressure higher up or at the top. The bottom pressure of a solid, which is the weight of the solid is certainly associated with gravity. That is really an important result, in that we have not confused the issue with the effects of heat; and more in that we can see, that as gravity acts uniformly, which means the interference of the gravity units and dense units is uniform, the pressure remains constant. We are therefore able to predict, that if by moving an enclosed gas against the force of gravity, since we increase the interference of our gravity units with dense units, the pressure must likewise increase. An experiment to test this result has still to be made and I have suggested that any increase of pressure might be measured by the appearance of increase in temperature. The pressure of a gas in a rising balloon tends to discharge some gas, but as the pressure of the air diminishes in height, it is as yet impossible to state how much of the discharged gas is due to increased gravity action and how much is due to differences of pressure with the atmospheric pressure. There is a crude experiment which seemingly elucidates this point in that a falling man tends to gasp, which means the pressure in the body, due to less gravity, is reduced; but of course nothing can be definitely based thereon.—A falling man is not bound to gasp he could breathe out; but naturally he does

not, hence my idea is there is some connection with the reduction of the gravity units in his architecture.

Increased pressure of a substance indicates the volume would increase if permitted to; and if more substance is packed in, the volume is either increased or the pressure. But whereas the intersistence of gravity units in a gas undoubtedly occupy some space during the momentary states of appearance, it is only when they interfere with the intersistence of the dense units that force is in action; so if the sides of the vessel enclosing the gas could be removed and the conditions studied at that moment, the dense units of the gas being interfered with by the gravity units would intersist in fresh positions in all directions. The gas at that moment would weigh considerably less than when enclosed. The reason of this, in the words of this theory, is that the insistance of reappearance cannot be transmitted from one dense unit to another in the line of intersistence of the gravity units with a gas. Thus the gas only weighs because it is kept in position, that is confinement. For instance a pile of steel balls placed on the pan of a balance would never weigh the same at the moment the pile lost its stability and crumbled down. Therefore to get the gas to weigh, the numerous and constantly recurring insistances of the dense units must be transmitted downwards, and joining with the downward insistances of the units of the glass vessel, such is all transmitted eventually to the pan of the balance and so on. The cohesive dense units of the glass vessel then decide the distribution and concentration of the various insistances produced by the interference of the spacial gravity units with the dense units of the gas and glass vessel. If we had the units moving like the kinetic molecules, this could not be worked out in this way with gravity as a continuum.

Possibly to see the point more clearly, the perusal of the next chapter on Cohesion should be undertaken. For undoubtedly Cohesion is to be seen in the viscosity of a gas; and the way the matter has been put in the foregoing, cohesion of a restricted gas must be greater

than a moving one. Though this difference may not be experimentally provable, in that a restricted volume of gas is internally movable, but we have as evidence that the viscosity of a gas increases with a rise of temperature, although alteration in pressure does not virtually affect it. Remembering that cohesion is intersection of spheres of co-ordination, our spheres of co-ordination of a restricted gas ostensibly are therefore not affected by pressure, but that only means that with a gas the variability of intersection is not affected by pressure, though the intensity of intersection will be. With a free moving gas variability and intensity of intersection are bound to take place. As an illustration we can bring forward the greater cohesion of a pile of spheres built up and therefore restricted, as compared to the cohesion of a pile of such spheres in the act of rolling down and spreading out.

In far more simple language, the difference between the down and upper pressures gives the weight, seemingly explaining all; but we are not concerned with isolated explanations which cannot be applied generally throughout to all phenomena. Had we not discussed the question of distribution of forces in a previous chapter, we could never have seen so clearly, why the force of the weight of the gas passes through everything downwards, whereas the pressure of the gas only went skin-deep. And we have gained much in learning that gravity, like heat, can produce pressure in all directions: and more than this we are able to predict that even if all heat were abstracted from a gas, we still would have pressure developed by the ever-present gravity. But according to the Kinetic Molecular theory, heat being the molecular activity of molecules, the pressure of a gas became a kinetic effect; remove heat and there should be no kinetic effect, that is there should be no pressure. The reply might be that no matter could exist as a gas at an absolute zero. Such is merely a statement, and is not borne out by facts; though there are certainly indications, that as it requires heat to vaporise any solid or liquid, a gas seemingly is an

impossible condition in the entire absence of heat. Yet on the other hand gases refuse to be liquefied, unless the critical pressure is applied. Be that noted.

The main point however has been reached, in that we can shew reasonably how a gas weighs, which cannot be satisfactorily arrived at, if we have the gas in the shape of molecules flying about; apparently in a vacuum. For under those conditions the action-at-a-distance gravity could only momentarily compel the bottom molecules to give that extra or excess pressure, which has to be the weight; and this can never be termed as the weight of all the innumerable molecules above them, which apparently, though under the influence of gravity, at the most can bombard their fellows below them with extra force. This, according to the theory, is equilibrated throughout the volume of the gas, and thus there should be a loss in pressure.

The inter-diffusion of gases is governed approximately by relative densities, but such does not recognize differences of pressure, thus differing from mass movement. If then the inter-molecular motion of the molecules really exists and the intensity is proportional to the temperature, one would expect the speed of diffusion to be increased; that is two cold gases would diffuse into each other much slower than would be the case if they were heated which is not the case. The mobility thus seems to depend upon some constant factor; and viewed our way, we naturally suggest, that as the spacial gravity units are ever and uniformly intersisting in all things, this displacement is entirely due to that effect.

Introduced heat units are merely a definite amount of units inserted in the volume of the gas; true they thus expand the gas but only to a certain limit. Gravity units however are incessantly intersisting in the volume of the gas; an important difference. In this chapter we cannot deal with the behaviour of these units, but we maintain they are occupying space, and that temperature is entirely regulated by their degree of concentration. And it follows that an expansion of a gas necessarily develops

more space, allowing of the heat units being diffused and not kept in a concentrated group. This is in agreement with the reduction of temperature in expansion. Illustratively, we can say the incessant appearance of the gravity units is a disturbing element, hence diffusion.

So far, we are unacquainted with intersistence phases of gases of various densities, but we have it already laid down that the sphere of co-ordination of a gas is greater than a liquid and the latter greater than a solid. Hence as distances have to be taken into account, and both dense and gravity units have volume, it can be easily seen that the intersistence of gravity units in a light gas must have less directive effect than would be the case with a heavier gas, a liquid or a solid. The distances of reappearance of, say, a dense unit, when its intersistence is interfered with by gravity units, we can see under the chapter on gravity necessarily increases. In the diffusion of gases we have to take into account their mutual interferences in addition to that of gravity; hence we cannot obtain under such circumstances the manifestation of acceleration in one direction. But as we have both gases intersisting in all directions, it stands to reason that those units intersisting at various points more intensely than other units will make their reappearances in positions and at succeeding moments more accentuated, than with the denser units. It is difficult to find an illustration to make this clearer without sketches; but the idea can be reached in that it is easier to spread things moving, than similar things with less mobility. Perhaps put in this way the idea will be grasped, if we realize the ease of disturbing cork balls as compared to the difficulty of agitating lead balls. If now we judge the effect of a downward force, a jab into a basin of cork balls will not be felt as much as a jab into a basinful of lead balls. Hydrogen is intersisting in all directions, where the solid lead is roughly intersisting in one position.

This now leads to evidence, that the kinetic Energy of molecules is derived from Gravity. Thus by this means we again have proof that Gravity is Energy, which is

what we always thought it to be; but owing to misconception, we have never been able to transmute gravity into the other forms of energy. Not that we have any Kinetic Energy in our body, far from it; but we have dense and energy units, the intersistence of which, in varied positions, manifests what has been termed Kinetic Energy.

And instead of endowing units of dense matter like gaseous molecules with unexplained, but inherent powers of, what is practically, spontaneous motion, we see in the universal Gravity an Energy which brings about action, the nature of which has never been seen, but only hypothetically supposed to exist. And much in the same way have we shewn the unreality of action-at-a-distance, thus taking away from mass the inherent power of mutual attraction, and in place shew that that energy is existing in the form of gravity units, like all other things that move through space.

We therefore do not get the repulsive idea of conceiving molecules vibrating in response to heat, which at the same time can shew translatory movement performed by the absorption of some form of energy which no physicist has or ever will locate. We know they are advancing with electrical knowledge and are succeeding in filtering out from a plenum of energy units to make accounts tally, but they will meet the same stumbling block they have met before; which is a force as mass into acceleration; and as far as I can see they are reaching a point of accepting mass as being variable. We know already what some people have done with Space and Time, and we can quite believe what they are going to do with the rest.

Chapter X.

Cohesion.

. We, as in modern physics, have decided that Matter in the reality consists of units, which can cohere to form, what is termed, a system.

A system means co-ordination of parts; hence a single unit cannot be classified as a system. By this a building, a living organism, and an atom of electronic composition can each be considered as particular systems. A rabble is not a system, but a battalion is. A piece of cloth is a system of threads.

Generally, we feel that integrated parts are a system, in that force is required for effecting disintegration; but it is at once realized that such disintegration may be partial or complete. We can gather that removal of a foundation stone may bring the building down, to crush into pieces; but the force removing that one unit is not really accountable for the subsequent debris. In this case gravity is.

The force to divide a gas into parts is less than that required to divide water or a solid. The forces, causing disintegration of chemical compounds, usually exceed such considerably; and now we learn that the kinetic force of an alpha-corpuscle is able to split up an element, thus being the most intense force of disintegration known. To split up light, it is considered no force is called into requisition; but we can doubt this contention, which is mainly built on the erroneous idea, that light consists of aether waves and not of corpuscles.

We are thus able to say, that there appears to be three forms or types on which systems are constituted. Firstly, those systems with the parts relatively fixed in position with each other, as in solids; secondly, we get the system under dynamical equilibrium, as a piece of mechanism, and reservedly we add the electronic atom

and gravitational constellation; and finally, the system, where the parts appear unco-ordinated with each other, as in gas; and we now can add the so-called rays, waves or corpuscles of energy.

A gas enclosed in a vessel is a system, in that it can distribute the force of pressure, it can weigh, conduct light, heat and so forth. A ray of light is a system in that it can be divided or compounded, and continue action as a system; just as much as a file of soldiers can be viewed in the same way.

There is no doubt, that a system must be based on some definite conditions in the Reality. It is a manifestation of considerable import.

With the nature of intersistence, it is possible to define a system in universal terms; namely, that when the loci of appearances are co-ordinated with each other, such units can be said to compose a system. The units of light intersisting progressively in a line, by this becomes a system; just as much as a jet of water can be so considered. This necessitates us in assuming, that the units of a gas when enclosed are co-ordinated. This they must be, in that a gas does equilibrate a pressure uniformly.

We have shewn force to be insistance of reappéarance of any unit, and the united insistances of any system, as in mass, is Inertia. We can therefore say, that the inertia of a unit in a system is the basis of Cohesion. We have now to shew how co-ordination constitutes the same.

The general idea is, that the intensity of cohesion can be ascertained from the amount of force required to produce disintegration. This is not by any means always the case, for we have many chemical combinations, like fulminates and other explosives, which disintegrate on the application of a very small force. Glass under severe internal strain may shew coherence, which can be made to disappear by the slightest touch; a force incomparable with that force, that would be required to grind the unstrained glass into the same quantity of powder.

Gold, at a temperature just below melting point, somewhat like zinc and other substances, breaks up into pieces with a much smaller force, than would be required to disintegrate that lump of gold a few degrees lower in temperature. In the case of the glass, it is looked upon, that the internal strain is the disintegrating force set into action by the small outside force, much as a wall disintegrates by the force of gravity after the foundation stone has been removed. With gold and zinc, heat has produced a molecular change destroying the cohesion of its parts in a way, but such only takes place at a definite temperature. Naturally physicists consider there are such things as molecular and atomic forces keeping the units together in a state of coherence, and apparently consider that disruptive forces may lie in the system in a potential form. The latter is difficult of conception.

The cohesion of the parts of an atom of an element, at the present day, is attributed to the force of attraction of the two opposite polar forms of electricity. Its disruptive force clearly must lie in the repulsion evinced by similar polar forms of electricity. In both cases the forces are of the action-at-a-distance type. An atom is a system in dynamical equilibrium. In principle it is a piece of mechanism, but devoid of material connecting links. Suitable bombardment is supposed to destroy the equilibrium, but the energy liberated thereby is in excess of the energy, ascertainable from the disruptive force of the outside negative electrons and their kinetic energy. This is really nothing much out of order, in that the heats of combination in chemical compounds are not by any means shewn to be in exact correspondence with the disassociation equivalents.

Such is the modern idea of the nature of atomic cohesion, the mobile cement being electricity, which in turn also accounts for the explosive force of disruption. We can admit this, if we believe in action at a distance, and that there are two kinds of electricity; but what the nature of the coherence between atom and atom, to be able to form the solid piece of iron we have before us, is, we cannot say.

If a dynamical electrical constellation is in equilibrium, this atom can shew no electrification to a neighbouring atom; that is the constellationary nature of the atom cannot be extended to the molecule,—taken as it ordinarily is to be a system of atoms. We can thus ask in our ignorance how do atoms cohere? How do molecules cohere? In fact, we can ask the physicists, what is cohesion, hardness, pliability, elasticity and much more? Indeed, we must learn how tension and stress (compressive) as manifestations are interpreted in the Reality.

If a rope is hitched round a post and tension is produced in the rope by pulling, clearly this force concentrated at the post is veritably pushing the post, in that the force is directed to the back side of the post in direction towards the puller. If all the strands and threads lay as straight lines absolutely parallel, under tension they would not cohere; in fact there could be no rope. If the rope were stuck to the front side, it could be said, the post is truly being pulled and not pushed. But the conditions in the rope are exactly the same either way.

The nature of the cohesion in a bar of iron is such, that a force can be transmitted through it both by compression and tension. With liquids and gases this duality in action becomes less impressive. The so-called force of cohesion is, therefore, not so comprehensible as the constellationary internal cohesion of the atom.

Whether we twist the strand in the rope in order that it may hook itself to the neighbouring strands, much as the rope was hitched by a loop to the post, or bind the strands with cementing, we have still to explain the cohesion of the parts, molecules or atoms, composing the strand. In that way we reach to a cross-section of the strand, the length of which is so small, that the compressive nature of the strand must be in correspondence with the tensive nature of the same. But since tensile strain and diminution under compression are of different orders, even in the same substance, the mechanism of

cohesion decided upon must meet such requirements.

Communication of momentum by impact, and pressure by contact are matters of daily experience. In both instances the force is transmitted through the dense systems in time. It has been previously shewn, that such transmission of forces, by studying the conditions unit-wise, receives a sound explanation by intersistence. The united force of the system being the sum of the units of force, which we have learnt to be instances of reappearance of the units. From this it is intelligible as to why solids shew variable compressibilities, but it is a significant fact that under compression particles may cohere or may not. During compression undoubtedly a force opposing such is in existence, which is comparable to inertia of mass. This is the instances of the units to reappear in their co-ordinated positions. It is admitted, that it takes time to assert complete compression throughout the system, just as it takes time for one solid to diffuse into another. We can easily visualize this, by taking professor Reynold's experiments with shot or sand in bags containing definite volumes of water for examples. A limit can be reached beyond which no compression can take place; and in the case of gases it is found that coherence can only be attained below a certain temperature. According to this theory, since heat occupies space, unless that matter is removed the co-ordination of the units will not resolve itself into a denser form from the less dense state. Remove the pressure, liquid air still continues as such for sometime, even although the extraneous temperature is increased. We have, as it were, forcibly abstracted heat by conducting it out, thus allowing the spheres of co-ordination to intersect. Once the new co-ordination is established, like with inertia of mass, unless there is interference that co-ordination will persist.

We have, so far as has been shewn no other force, than instance of reappearance of units, and unless such suffer interference the co-ordination must continue. But what we have got is a gravitational field in which all

matter exists; and in this the gravity units interexist in all loci, not temporarily taken up by units of energy and dense matter. We have dealt with their deflection in the chapter on the Transformation of Gravity, and it should suffice for present purposes to say, that the amount so deflected is inconceivably small as compared to the undeflected quantum measured in time.

When we say that interference of one unit in a system is communicable to all the other units of the system in degree, governed by the phases of interistence and spheres of co-ordination, we must bear in mind that though a definite co-ordination may have been established in a system, we have the presence of innumerable gravity units besides other energy units in that system, keeping, as it were, the architecture or system of co-ordination from internal trouble. Outside the system we have a gravitational field much as like unto the Earth's gravitational field, excepting the top-side is incomparably greater in intensity to that on the under-side; but still at grazing distance a strong field is in existence, which enables dust and other particles to cling to surfaces in an extraordinary way. The segregation of filings and other metallic particles precludes us basing this attraction to the gravitational attraction of mass for mass; hence physicists treat this as a new force, much as Laplace did with his surface tension to explain capillarity, and as radio-physicists do with their electronic evaporation constant.

It is intelligibly seen as laid down in the chapter of Co-ordination, that the moment intersection of spheres of co-ordination takes place a system of these units is instituted. The varying postures of such units, rectilinearly constructed, virtually can be seen in a mechanism consisting of cog-wheels. Intersection of the spheres of co-ordination would correspond with inter-meshing. And by this example, as illustrating the conditions, we can gather that if all un-meshed cog-wheels have their own motion of rotation, they can only be made to inter-mesh, if their rotary conditions allow of such. In the

same way the phases of intersistence determine permanent cohesion or not. Any disturbance communicated to one wheel, in degree is transmitted throughout the train of wheels; and so with the units, possessing spheres of co-ordination intersecting each other, a disturbance in that system must be propagated throughout. Anything getting into the mesh is a disturbing element, and from this we can picture how the so-called molecular changes take place, and how the alpha corpuscles can disintegrate the atom.

The intersection of our spheres of co-ordination can, if the time phases so allow it, be made so intense, that the units are virtually undergoing reciprocal intersistence, which means that the loci of intersistence of two correspond to all practical purposes.

This to us represents the atomic or elementary nature of matter. Though the spheres of co-ordination may absolutely coincide, the postures of the two units may not be identical. We cannot state this emphatically at this stage of elaboration, but judging from various stages in which reciprocal intersistence can be reached with the intersection of the spheres of co-ordination representing Cohesion, we can safely look upon chemical union as the intenser form of Cohesion manifested to us.

Thus can we picture to ourselves a molecular system consisting of the primordial units grouped into minor systems, where co-ordination is assuming the reciprocal nature of intersistence, which do not favor disruption; in that the locus of space is fully taken up with appearances. No wonder, then, that within these minor systems, which we may now term atomic, the units of gravity cannot interfere with their intersistence, entailing that the simplest atoms must be the least dense of all. I think this bears out the latest idea in radio-chemistry, which is that the elements are transmutable. And we have this advantage, in that this theory allows us to trace back without difficulty all things in occupation of space and persistence in time to primordial units, identified with gravity.

If the reader sees, that a sphere of co-ordination describes the condition of a single unit interexisting in its various postures, it is possible to extend the application of such spheres to compounded units, which in themselves are co-ordinated. The only point to be borne in mind is that the primordial units suffer change of posture, whereas a system of units is not bodily changing its posture. Hence the sphere of co-ordination in larger systems will assume the shape of the systems, whatever that may happen to be.

In this way the nature of our Design is complied with. At the one end, we have discrete or unco-ordinated primordial units, identified with Gravity, which in interexisting in lines of progression opposed in direction, naturally can thereby acquire reciprocal interexistence. The ultimate object is to pack space with substance, hence when reciprocal interexistence is attained, interexistence in progression must cease, in that interference becomes impossible. If that were not the case the Cosmos would be chaotic, which we feel is not so in the reality. If the nature of the Design were not to pack space, then there would be no sanction to have the primordial gravity units interexisting progressively in lines directed towards a nucleus. In fact no nucleus could be formed, if the Design were omitted. This digression is the subject matter of the chapter on Evolution, to which the reader must refer.

We have thus established a uniform explanation of cohesion in its various moods: Cohesion is based on integration, which is dissipation of motion; in that interexistence in loci situated closer and closer together is the reality of integration. Two cog-wheels when inter-meshed can be constructed to rotate without disruption, provided they rotate in consonance with each other. No force is required to bind the pair, and thus convert them to a system. And so with our units, provided the interexistence phases and postures allow for it, those units will interexist in co-ordination; and unless a foreign unit interferes, the units of that system remain in co-ordina-

tion. The stability or equilibrium is ensured, as long as inter-meshed cog-wheels have their inherent motion absolutely in correspondence with each other; there thus can neither be friction nor any appearance of disruptive forces. The system is in co-ordinated, though not in dynamical equilibrium.

We do not explain Cohesion of the atom differently to that of the molecule, or even tangible mass, like as is done in modern physics, or rather as is being attempted at; since there is vain believing that the gyrating electron will account for everything. Nor do we postulate anything new, since we know the human mind is not satisfied with a recurring variety of postulations or certifications, that this and that is the nature of things; it being known that in nearly all cases the reverse can take place. We are entitled, however, to postulate, that it is the nature of matter to occupy space, because the reverse is inconceivable, in that a thing persisting in time must also be entertained; but it is not an advance to postulate that mass moves towards mass by nature; and thereby merely see in that, that there must be a force of attraction producing that motion; the reverse being continually in evidence: So that with Cohesion, it is no advance to say that matter adheres together or coheres by nature, and therewith introduce a force to account for cohesion, as long as disintegration is possible. Force, as a separate reality to Matter, Space, and Time in modern physics, as we have previously shewn, cannot survive. Potential Force has really no meaning, in that Force is connoted with activity. It is far better and certainly more consistent, and to my mind is far more likely to be the truth, to see, that wherever cohesion is manifested the reality underlying the same is not and cannot be variable in nature. Thus can we be satisfied that integration and disintegration, cohesion and disruption, throughout the Universe are effected by an existent force of insistance of reappearance of any unit, as an additional quantum.

Whether we disintegrate common salt in a mortar or dissolve it in water, the cohesion is undoubtedly destroyed,

and disintegration is effected by the interference of intersistence. A new state of co-ordination is thus established. If the phases of intersistence are such that interference cannot take place, in that case neither a diamond can be abraded, nor can common salt go into solution.

Modern science, with its electronic ideas, can do neither in a comfortable way. Either a vast amount of imagination is required, or mathematics is used to torture out of us a confession of some sort or other. Nor is it one wit better off with its Kinetic Molecular Theory. For on the one hand we are told, that the mobility, a sign of disintegration of the molecules of a liquid, is increased by pressure; and on the other hand we learn heat increases such mobility. In the face of this, it could be contended a vacuum, or decrease of pressure, would minimize the mobility; yet water under such conditions ostensibly boils. If we increase the mobility by pressure, we can also boil water.

With us pressure integrates and heat disintegrates; and we can venture to say, that the apparent mobility of, say, lead under great pressure is only evinced, in that the pressure is not uniformly applied. It moves, because it can move, just as the substance of glass can be moved in its, so called, vitreous condition to effect a polish. Therefore, we predict, that there is no fluidity, in the ordinary sense, in a solid under uniformly applied pressure. That is, a cork at the bottom will not rise up through a mass of iron under an uniformly applied pressure, no matter of what intensity.

If pressure really produces liquefaction of solids, then it could be reasonably assumed, that intenser pressure would produce vaporization. We naturally rather think it must be the reverse, and that the seeming anomalous behaviour of solids under pressure can be explained by noting, that the transfusion of solids is an experimental fact, which this theory of intersistence can explain very comfortably, in that we have always an unoccupied locus of the disappearance period for occupation; and can thus

virtually pass one solid through another. If that can be done, we can arrange that a member of an overcrowded house can pass out an exit, but it is not necessary that the members of the crowd should be a seething mass of mobility to effect this.

The restituting forces of Elasticity, Sound and Waves must be due to the gravity units of the gravitational field in which such phenomena naturally occur.

This can be realized by seeing that the inter-space in a dense system of units is being continuously, though momentarily, occupied by the primordial units of the Universe, or gravity units. These dense systems of units by co-ordination in a gravitational field will manifest elasticity, in that it can be pictured that the inter-space is infested with these primordial units. No wonder strain produces heat and tension the opposite. This to us is gravity deflected above and below normal.

Just as physics is silent on the nature of Cohesion, it tells us nothing as to what the forces of restitution are, or how they act through the cohering parts of any system.

With our system of co-ordination we can explain the transmission of a force through a coherent system, but more is required to explain its reflection. Sound is the vibration of something finite. We can understand a unit being displaced by interference, but it is quite another matter restoring it to its former position. If nothing were known of gravity, the oscillations of a pendulum would be inexplicable; and a force of restitution would have to be invoked, as has been done with Elasticity. We can feel quite certain that sound is not transmitted through inelastic substances. The co-ordination of the units of such a substance does not allow the force of restitution to act. Again we empirically know, that the denser the elastic substance is, the more speedily this vibratory disturbance of the units pass through the system. In short, we can feel sure, that a vibration passing through a dense system is an alternation of states of compression and extension.

If we revert back to the subject of pushing and pulling, to create either state we must have interference. In the first case, the interference must conduce to integration, and in the latter to disintegration. With sound, kinetic energy, introduced in a system from without, is extremely faint as compared to the kinetic energy of, say, an atmosphere of molecules vibrating in consonance, throughout an enormous building. A gentle touch of a point applied to the surface film of a pool of water, appears magnified as a circular ripple, which enlargens itself in a circle spreading to an extraordinary distance. Let physicists estimate the work done in raising that ripple of water against the hydrostatic pressure, and compare such with the energy introduced in first creating the disturbance; and in addition take note of the alteration of temperature, which always shews an increase during vibratory disturbances, therefore a dissipation of energy. A tuning fork vibrating in air enclosed in a vessel, shews the heat developed has expanded the volume, or otherwise the increase of volume cannot be accounted for. The repulsion of bodies, heavier than the medium of transmitting sound, by a tuning fork requires explanation; especially in that the reverse occurs, when the body is of less density. Here work undoubtedly is being done, and there seems to be no reason to think that energy is abstracted from the tuning fork for that purpose; in that it continues its vibrations, as far as can be gathered, whether a suspended pith ball is brought close to it or not. Then if we take Fatigue in Elasticity into this account, the idea of restoration can but suggest, that energy for that purpose is acquired from extraneous sources.

Seeing then, that we are in want of a force of restitution, with our gravitational fields we can consider, that the gravity units intersisting within a system and exerting an enormous pressure, as it were, even on the outside at grazing distance will supply us with that force: For it must not be pictured, as if the gravity units are flowing through the system, they are but innumerable points impressed within the architecture from moment to

moment in consonance with the phase period of the intersistence of those units.

So far, we are unable to even conjecture the mechanism of this action, but we can assume that the spherical co-ordination of the units of the transmitting system are intersecting, *i.e.*, the cog-wheels remain in mesh, and such is attainable with conical spur-wheels, where it can be designed, that less or more space can be taken by sliding two cones inverted to each other. In the absence of direct experiments, bearing on the liberation of energy from a gravitational field, it is difficult to bring conviction. If a tube has a gas passing through it at an enormous velocity, and such tube shews, on that, a greater resistance to bending, we can get some idea how gravity with a velocity, possibly exceeding light, is able to assist cohesion with elasticity.

Thus, this theory entails that elasticity and all vibrations are a function of gravity; that is elasticity and vibrations will increase with an increase of force of gravity, and diminish in correspondence; nor do we thereby disturb our idea of cohesion.

The kinetics of chemistry, based on the electronic constitution of the atom, is in its infancy; but it is in an uncompromising position, in that the great law of the Conservation of Energy is being defied. With one swoop we have obliterated the idea of a special chemical energy, and relegated the science of Chemistry to Physics, as a part of the science of Cohesion. Aware of correspondence between the measured energies of chemical union and disassociation, we are also aware of the constancy of gravity from which we derive by deflection the energies liberated in chemical phenomena. And it will be interesting to watch, whether this is borne out by the latitude at which experimental equivalents are, and have been, variously determined. Explosive effects with us have a much clearer interpretation in this way, than in modern physical chemistry. The potential molecular energy, which has to account for all this, need no longer be incomprehensible, in that it has no position in the

Reality. And whilst radio-chemists are much concerned about the penetration of Helium, we are not. In that as with the transfusion of solids, our locus of disappearance amply provides for the passage of one thing through another. For it is in that way, we can make Light proceed in opposite directions without clashing. Our theory is also not particular as to the distances of loci of reappearance. If anything does move, the spatial phases provide for all extraordinary movements.

Before closing this chapter, it may be pointed out, that hardness and softness are entirely governed by the phases of intersistence. A brittle soft substance is similarly so. Penetration and solution are accountable in the same way. The hardest substance, a diamond, disintegrates in the presence of heat and oxygen, whereas gold a soft metal does not behave that way. Refusal and acceptance are entirely governed by the nature of the architecture; and it is futile attributing such to affinities and aversions.

Chapter XI.

Gravity.

Accustomed as we are to perceive motion transmitted from one body to another by contact, and have utilized the idea of force, in terms of mass into acceleration of that motion, to account for such transference; with those terms we have to face, what is termed, Action-at-a-distance,—where motion appears in a body without being derived from contact of another body.

Such, at first, must have appeared somewhat revolting to those then only acquainted with instances of movement by contact; but considering the motion was somewhat different, being of the accelerating kind, whereas motion by contact shewed more uniformity; it is reasonable to take it, that such forces, as those acting at a distance, might have had a different origin, and therefore might have behaved differently. Newton must have felt this dilemma, in that he astutely cleared himself by enunciating the law of gravity, as being the nature of things. He was, thus, not called upon for further explanations. To move anything it is commonly accepted, that it must be either pushed or pulled. He elected the latter mode, though there is no reason, why the former method should have never been considered. Consequently having selected upon the pulling method, it was only reasonable that he should believe that the two masses attracted each other mutually.

The force of gravity in large masses, like the Earth and Moon, is said to decrease in proportion to the square of the distance measured from the centres. With very small particles the rule of increase and decrease is supposed to be different. In liquids this force, at a distance less than 10^{-7} cm, is calculated to be reckoned in hundreds of atmospheres for an area equal to 10^{-8} sq. cm. There is absolutely no reason why any exception should be made for such cases, except for accommodation, in that the attractive force of gravity is inherent in matter.

There should also be no distinction in that case, between the part and the whole. But as we know, that matter can be electrified, and that charges of opposite signs attract each other, and also repel each other if of like signs; such is evidence, that the effects of gravity may be thus interfered with. However, for our purpose, at present, we will assume Newton's law as correct; but with this proviso, that we must not permanently believe it to be so, after this matter of action-at-a-distance has been discussed.

A gravitational field of one mass, taken as a whole, in name indicates potential Energy in some form or other located in that region of space. It is impossible to conceive an action of any force, unless such is virtually derived from energy in existence. The law of Conservation of Energy entails us measuring energy in finite quantities of a finite whole; therefore this potential energy of a gravitational field must be a finite quantity, unless we assume the field radiates out from it energy and absorbs from the outside energy to make up for the loss. To disintegrate the mass, possessing this gravitational field, undoubtedly would require work to be done; which means some outside energy would have to be called in. But since a mass can be disintegrated seemingly by itself, witness the work done in this respect by living organisms, volcanoes and other terrestrial agencies, we are bound to conclude, part of the total potential energy of a mass is always available for these effects.

If we agree that energy must be located, it becomes a matter of minor importance, what quantity lies in the earth and what lies in the sun; for we are agreed that transference of energy is at the bottom of all phenomena. There is, therefore, no reason to always call upon the sun for all activity on the earth, as there are no data to shew what is taken in by the one mass from the other, or is radiated back in return.

A stone discharged from the earth, never to return to the same gravitational field, is energy lost for good. But if there were only one planet, in the Universe, the

stone would be bound to return by law of gravity and restore the energy on coalescence. If there were only two planets, we can imagine the stone being propelled from the one in direction to the other, and in its course would actually gain energy. For, we will presume the energy lost by the first planet is lying in the propelled stone; and as it does not return and deliver back this energy, it must be carrying it through the whole course, whilst the second planet is attracting it. When it reaches the second planet, the stone possessing kinetic energy due to the second planet's attraction, delivers this up on coalescence, plus the energy it took away with it from the first planet. In the light of conservation of energy this in effect is impossible.

All this cannot be logically followed out on the basis, that gravitation is a force acting at a distance. We can only conclude, that either the mechanism of gravitation is false, or else the conservation law of energy is at fault; otherwise we must alter our conception of what energy is. This latter procedure, I think, would be difficult, if not impossible; and considering the laws of gravitation and energy conservation are assumptions of convenience due to limited knowledge, they will have to make way for something with better support.

I think we are agreed, that if a mass does do work in attracting a middle body from a gravitational field of a third body, there must be some transference of the energy of the attracting masses. Heat from a boiler disappears into the kinetic energy of an engine, which in turn does work with loss of some of the kinetic energy. These can be traced systematically, but not so in the above case of gravitation. Now the mass attracting the middle body certainly does work and must lose energy; but the middle body moves, hence has gained kinetic energy. When it coalesces with the attracting mass, ostensibly the latter has received energy in some quantity in return for the energy expended in attracting the middle body away from and against the force of the third body's attraction.

This is the peculiar part played in gravitation, in that

the more work a mass does in these operations, owing to its increasing mass, its power of doing increasing work is intensified. This is seen, in that the force of attraction increases directly with the mass. With magnetic and electrostatic conditions, this is not so. A magnet loses its power of attraction, the more iron filings it attracts to itself. A limit is reached. With electrostatic units of different charge the culmination of mutual attraction can end in complete impotentiality. By taking the iron filings away forcibly from the magnet, a small amount of the magnetisation power is also dissipated, but the magnet, somehow or other, can recover its power in time. This we deal with in a future chapter. There are of course other properties in respect of the power of magnetisation and electrification, which need not be entered into here; we are only satisfying ourselves, that Action-at-a-distance requires considerably more consideration, and a simpler explanation, than we have up till now been supplied with in the matter of gravitation.

A large fragment of iron can be placed so close to a magnet, that it just will not be moved by the magnetic force. A smaller fragment placed in the same position will be moved with accelerating motion. Ordinarily, this means that the force of magnetisation does not increase with the mass of iron. With gravity this is different, in that two bodies, no matter what their size or density may be, fall in vacuum with the same accelerated velocity; which means the force of gravity has increased with the mass. The attracting body did not, of course, know what was going to be the nature of the falling body. This idea, that the attracting mass accommodates the circumstances is overcome by the necessary assumption, that the force is proportional to the product of the attracting and attracted masses; hence the force of mutual attraction must vary. This is also seen, in a somewhat similar way, when one pole of a magnet attracts the opposite pole of another magnet. Incidentally from this we learn, not only the meaning of magnetic mass in terms of magnetic force, but a correlation is observed to ostensibly exist between Mag-

netic Mass and Inertial Mass in terms of gravitational force.

If we adopted the pushing idea for gravitational effects, it can be easily followed out, that if the two masses are being pushed together by equal forces, (the masses being equal) they would meet at a point midway between them; shewing that the velocities are respectively equal. If the masses were unequal, their respective velocities would of course make them meet always in the territory of the greater mass. The total distance passed through in both cases would be the same. If the forces were continuously applied in shocks, or by means of an ever-increasing current of air, the uniform translation of the former case could be converted into accelerated motion in imitation of gravitational conditions.

But we have no means of measuring the distance passed through by our Earth, when a stone falls from a height to ground; and we dare not at this stage say what is happening when dust particles of great density remain suspended in the air; nor is it wise to discuss, here, the force which causes aggregation of solid particles, as when metallic filings cling together.

By this pushing method, we are converting the inherent gravitational power of matter into an outside force, and thereby get rid of the previous necessary assumption, that mass contained potential energy, which in the form of gravity force could do work under conditions, we noticed were so dissimilar to those of other systems in Nature. And be it noted, that thereby the manifestation of attraction or action-at-a-distance cannot be carried into the Reality. All attraction thus becomes resolvable into proximation due to outside circumstances. Or better put, action-at-a-distance producing attraction, as we see it, does not lie in the bodies under mutual attraction.

If the reader has absorbed this properly, it can now be seen, that an explanation is forthcoming as to why there appears to be no loss of energy of a planet, which undoubtedly must be doing work in continuously deflect-

ing a satellite against its inertia; for the simple reason that the satellite may be being pushed towards the planet by the same agency that pushes the falling stone to the earth. The work done on the satellite and stone is not thus derived from the potential energy lying in the earth, but is effected by absorption of extraneous energy, which we shall see later on lies in the so-called gravitational field.

Unfortunately real measurements, of large distances moved through by each mass in mutual attraction which can be checked, is not available. Measurements to be derived from the motion of the moon round the earth are not strictly direct, but are relative; and in addition, these can never be absolutely correct. A good deal of the motions are assumed inductively from the gravitational laws applied to the whole solar system. In fact, perturbations are explained on the assumption, that other things are, as they are supposed to be. Abnormalities were only known to astronomers, which never received mention in text-books. In this matter, therefore, I am obviously at a disadvantage, for which due allowance will have to be necessarily made.

If there is a solar system based on gravitation and inertia of matter, there certainly is no similar system reasonably close by to give Cohesion an astronomical position, as seemingly is obtained by the electronic theory of matter. All that Astronomy can tell us is, that the solar system consists of similarly constituted planetary systems within itself, and physicists consistently say that this type of co-ordination of matter should continue even on to the smallest portion of matter possible. It is immaterial for this analysis, whether we consider matter as space occupied by this or that; for there is always going to be a hypothetical indivisible unit, whether it to be an electron of electrical energy or a corpuscle of matter. The whole must be greater than its components *ad infinitum*, as long as we apply conceptions based on multiplication and division. But unity can be also reached by subtraction. This has been already shewn the ultimate unit must be

an object of creation on the basis, that we start the cosmos from nothing; so that this indivisible unit has to be accepted as a part of the whole. No scientist will dispute, that the workings and construction of the Universe will not be found to be uniform in the Reality. That is, it is not expected, as experience has taught us, that the more we dissect, the greater the complications will be; and that the present seeming uniform manifestations are in reality chaos. Our uniformity is the intersistence of spacial matter out of which I am going to reconstruct the Universe, if I have time to do so; but there is no need or even reason to take an elaborate manifestation as the solar system to be the unit system, in which form all other systems are built, and then carry this back and apply it to the cohesion of matter. If we must, then the question can be safely asked, "where is the cohesion or stability of the Universe?" If matter is endowed with gravitation, what keeps the constellations from coalescing to form one mass of finite matter in this infinite space of ours? If the answer is that such is in operation, then we are bound to assume the units of matter possessed originally only kinetic energy; which does not tell us how gravitation was developed or how the Universe avoided coalescence.

This solitary solar system is an enigma, that one almost doubts whether the apparent heavenly movements have been correctly resolved. There is no doubt out of a flat earth man has been able to produce a spherical mass, and finally has evolved the present astronomical interpretations. With all respect to the present human intelligence and insight, I cannot see that we are entitled to claim that our present interpretations are final. Einstein anyhow for the moment has given scientific thought a rude shock; and I am likewise about to do the same, though it may be diverted into a passing humorous effect. Yet each and all of us are entitled to give our best for the time being, conscious that finality has not been reached.

If we alter the gravitational effect from its pulling nature to the pushing idea, it has been seen that numerous

anomalies in respect of the location of energy could be explained, and the theory of Intersistence provides for this. The correlation of gravity with other forms of energy has never been as yet established, and my reasons are, that this is entirely due to treating gravity as an inherent property of matter, as established by Newton. The theory of intersistence having filled occupied space with one substance and no other, which has been termed spacial matter, and has converted energy into matter by the logical postulate, that what moves through space must occupy space; it can be easily seen that taking gravity as energy, gravity must be spacial matter. Hence, as the interaction of spacial matter produces insistance of reappearance which is force, the force of gravity is nothing else, than this interaction occurring between the spacial matter, representing gravity, and the spacial matter representing a stone falling to earth.

Demonstrating this in the unit form, we get the unit of the stone lying at rest, relatively to the earth, intersisting in a definite position. The unit of gravity appears in that particular position at the particular time, defined for the reappearance of the stone unit. Clearly the latter must reappear; that is it insists, hence being thwarted appears somewhere else. Let us suppose that this new position is determined to be in line with the line of intersistence of the gravity unit, which will be shown later on to be defined by law; then if no other gravity unit is available the stone unit would go on reappearing in similar new positions in correspondence with its previous appearance. The stone unit would in that case manifest uniform motion in a straight line. But as other gravity units are constantly intersisting with progressive reappearance on this line, and with enormous frequency, the intersistence of the stone unit is again and again interfered with; hence its manifested motion becomes of the accelerated type.

If we are allowed to introduce the term of speed of progression of the gravity units, this point should become clear, in that the speed progression of the stone unit is

always less than the "impelling force," or units of gravity. It is not necessary, therefore, to introduce here the reverse action of the stone units interfering with the gravity units. This subject matter will be fully dealt with in subsequent chapters, opening up an entirely new view of the energy of the Universe.

Since motion is only a manifestation of the altered positions of the successive reappearances of a unit, as long as the gravity units are in overwhelming numbers with high frequency of intersistence as compared to, what may be termed, the "dense" units of the stone of low frequency intersistence; and further as all units of the stone are of the same size, the manifested motion occasioned by the displacement of the positions of reappearance will correspond in vacuum (where there are no dense units). In fact, the theory has been elaborated on the basis, that as the accelerated velocities in vacuum are all the same, when produced by gravity, the dense units, as manifested in all ponderable matter, must be the same size: which of course is the same thing.

The reader must now divorce the idea of motion and force from the illustration of the falling stone, and thus see that the volume of a system, compounded of dense units, has everything to do with the manifestation of weight in the reality; that is, the more the dense units of low frequency are thwarted in their instances of reappearance, the greater the force experienced in manifestation. Thus the total weight of any body is in reality the sum of the thwarted instances. And since all dense units form a system manifested as cohesion, therefore at the same time that one dense unit is displaced its measured amount, practically all the other dense units are similarly displaced by other gravity units. I have said "practically," in that this theory predicts, that the force of gravity must be variable; to be dealt with latter on. So that what holds good for one dense unit, applies to all the other dense units of the system, which in this case is the falling stone. So far we have only dealt with the first instance, where the reappearance of the dense unit has

been thwarted, occasioning, what may be termed, the first unit of displacement. If the gravity units ceased on this to make their reappearance, the dense units would continue reappearing progressively at new points corresponding with the displacement; such would be manifested to us as extremely slow uniform motion. But as the gravity units continue reappearing along their lines of progression, the second reappearance of the dense unit is again thwarted and displaced another unit of distance, and so on.

To make this quite clear, we will imagine we have a row of empty chairs, the dense unit in intersisting is represented by the unit sitting and rising from the 1st chair, manifested as mass at rest. If the unit after rising sits on the 2nd chair, and so on to the 3rd and 4th, etc., such would be manifested as the slowest uniform motion possible. If, however, the unit after rising from the first chair wishes to re-occupy it, which is inertia of mass at rest, but finds the 1st chair is occupied by a gravity unit, necessarily the dense unit, being bound to time, must sit on the 2nd chair. So, after rising when the time comes to resume a seat, instead of selecting the same seat, the dense unit selects the 4th seat; that is equal to the displacement to 2nd seat in the first instance repeated. The dense unit would continue this selection, namely, the 6th, 8th, and so on, in the absence of any interference. But in selecting the 4th seat at the second instance and finding this occupied by a gravity unit, the dense unit occupies the next chair which is the 5th seat. In absence of further interference, the dense unit would occupy now in succession the 8th, 11th seat and so on; but in selecting the 8th seat, a gravity unit occupying it, necessitates the next or 9th seat must be occupied. The process can be continued and it is only necessary to point out, that the vacant chairs unoccupied by the dense units for each instant are 1, 2, 3, etc. The displacement is in arithmetical progression in correspondence with uniform acceleration and if we double the displacement to 2, 4, 6, we obtain the seats occupied as

1, 4, 9, 16, or the total distance passed under acceleration which is proportional to the square of the time. The real displacements for each period of time stands as 1, 3, 5, 7 etc. in arithmetical progression. This can be worked out.

The initial displacement strangely is not conformable. This rather indicates, that the manifestation of rest of a solid body is in reality intersistence of a dense unit in three loci. The distance of the loci being such, that the positions do not overlap. Thus no solid body manifestly can have a constant centre of gravity. This is as we should suspect, since no solid body can be poised on a point. If the centre of gravity had an unchanging position, poising on a point should be possible in the absence of earth tremors; with the assumption that the gravitational force lines underwent no swaying. But the latter is extremely unlikely, in that we know empirically, gravitational deflections are existent; so that we can never deduce by experiment the varying centre of gravity of a solid body from this nature of its intersistence.

We are not even in a position to lay down anything definite in respect of the intersistence of the gravity units, as the distances of the loci of reappearances may vary recurrently; but so far it should be sufficient, that the manifestation of gravitational effects has received a plausible explanation, in so far as acceleration of falling bodies is concerned.

It will now be asked, as to why the lines of progress of intersistence of gravity units obviously converge towards the dense units. That is, why has a gravitational field its centre in the centre of mass? I do not intend to reply by asking, "why should it not be the case?" or I could ask a similar question, "why does mass have inertia and uniform motion in a straight line"? Why not in curves? Little is to be gained in such questions unless put seriously. But I have to deal with many learned scientists, who will not look at anything containing the merest suspicion of the flavor of a design. I would point to the Design enunciated in the Introduction, as to the reason of the gravity units being created to fill the

infinite space. Necessarily they must tend towards the concentrated parts of space to complete the packing. We set out with the view of shewing, how the manifested elaborations of the cosmos were to be accounted for, by taking one uniform substance occupying space and persisting in time, on the basic assumption that such underwent interistence. We shewed under the chapter on Mathematics, that having nothing to start with, we must at least create Three Things, before that Multiplication and Division, like space and time, could elaborate anything. Hence the three simplest forms of substance, as the Tetrahedron, Octahedron and Cube were called into requisition; and since those three forms are transmutable and their substance being the same, I considered they were intro-convertible.

In this way do I see, how gravity units can undergo conversion into other units, of what we know as Matter, Energy and the Vital Force. I admit this can in one way be attained by truncation of the corners or edges, and that the tetrahedrons lying in a cube and octahedron are asymmetrical; thus differing from the simple symmetrical tetrahedron inscribable in a sphere, which incongruousness alone could condemn this aspect of the theory; but there is still much to be done, thus I must trust to the future, possibly generations ahead, when this difficulty will be overcome without appealing to new assumptions, as being the nature of things.

To advance, we must rely on the Design as support for laying down the law of convergence of gravity units; and as long as pendulum experiments shew abnormal deflections of gravitational lines, which they do, we have these empirical results in our favour.

Undoubtedly with this view of gravity immense strides have been made: We can at least handle gravity as can be done with any other form of energy.

Now there are three ways of accepting the nature of a gravity unit. It may be a compound form, which can suffer disintegration into Heat, Light and Electricity, and more obscurely into Vital Forces; or it may be the

primordial unit which can combine to form the above-mentioned substances; or the unit can suffer alteration of intersistence phase.

As gravity apparently passes through everything, one is inclined to give it its simple form. If so, then as the gravity units intersist in the atmosphere to start with, the displaced units, probably through such, re-combine to form an electrical unit, and these in turn can form the light unit, which finally becomes the heat unit. That this may be so can be judged to be so, in noting that the atmospheric electricity has not been satisfactorily explained as coming solely from terrestrial sources; and though there is a temporal connection between Magnetic Storms and Sun spots, the creation of these disturbances is not, as yet, directly traced through to such Sun spots. The aurora borealis are supposed to take place, or better put, can be seen, nearly every night in the north polar regions; so that these optical effects are apparently not indirectly connected with Sun spots. The blueness of the sky has a better explanation, if we view such as being the interaction of gravity units with the units intersisting in the atmosphere. This integration or as suggested disintegration continues into the mass of our planet forming the internal heat of this globe, and furnishing the main terrestrial electrical and magnetical manifestations. The same remarks apply to all dense matter, the sun planets and stars. The heat of the sun, stars and nebulae can be clearly traced to gravity energy, as this theory views it. Indeed I hold, that the energy of radio-activity is directly derived from these gravity units. However, the integration or disintegration process in small masses must be fainter than in large masses. But magnetism, electrostatic conditions, as well as radio-activity are observable in these effects. This portion of that subject, however, can be dealt with more conveniently and effectively in a future chapter, where we view alteration of phase as synonymous with transformation of gravity.

So far no direct proof has been brought forth con-

cerning this pushing nature of gravity. I propose to do so now, and bring this chapter to a finish.

Assuming the lines of progressive intersistence of gravity units are converging lines to a centre, like the quantum-energy-lines of light suggested by Planck, only in reversed direction; it can be easily seen that the degree of concentration of the intersection of these lines through a spherical surface will obey the inverse square rule.

It stands to reason, that as my gravity units appear *in* the earth, they are more concentrated than on any sphere greater than the globe. The theory, therefore, entails, that the manifested force of gravity, unless disintegrated or deflected should increase the nearer we get to the centre of the Earth. Newton's Law entails that it must decrease. As a matter of fact it increases, which can be ascertained from pendulum experiments conducted down deep mines by people well qualified to survey. In fact, it has been mentioned, that there appears to be some correspondence with the increase of temperature of the ground in depth. The increase of the force of gravity can be approximately calculated taking the degree of concentration of my lines of converging gravity units; but as we have already shewn the likelihood of these units being gradually converted into other energy units, the calculated result must always be greater, than the actual result observed. And I am inclined to think a difference will be detectable, if one experiment were conducted at the bottom of an open deep shaft and a second one undertaken in a crosscut away from the open shaft. The latter should shew a slight decrease, as compared to the open shaft experiment.

G. P. Lenox Conyngham in his introductional notice to the *Pendulum Operations in India and Burmah* (1915) regards the Kolar result, with others, which shewed an increase of gravity in a deep mine, as material from which ultimately a system may be evolved. And I may here give these results :

Edgar's Shaft underground = 978·133 dynes
 " " surface = 978·076 "
 thus shewing an increase of 0·057 dynes for about
 2628ft. depth. I may mention, that the only open
 workings close to and above the underground station was
 the shaft 18 ft. diameter, and this partly filled with iron
 and timber, with a high steel poppet heads above it. The
 surface station was a hundred feet away from the shaft,
 and therefore not directly over the underground station.

It is necessary, that the probable conditions under
 which the gravity units intersist should be dealt with, in
 order to realize what may be expected in experiments
 and how to conduct them.

One thing is quite clear; namely, that if the lines of
 progression converge to the centre of a mass the units must
 concentrate towards that point. Hence, if such is the case,
 it is obvious that their must be a limit of concentration;
 this means that a certain number of units must be
 continually thrown out of action, as their lines converge
 to each other. These we convert into thermal, electric
 and other units, which, as it were, escape by radiation
 through the system. For the time being it is not
 necessary to consider, whether gravity units can be
 compounded into dense units.

If we compare these conditions with the reversed
 effect, as in Planck's quantum lines of light energy
 radiating from a luminous point, we can note that he has
 made no provision for the apparent continuum of light in
 dispersion: It is therefore better to face this difficulty at
 the onstart.

According to this theory absolute obedience to the
 Inverse Square of Distance Factor is not necessary, which
 the Law of Newton entails. Our gravitational fields need
 not extend to infinity, and therefore they need not
 intersect each other.

To visualize this possible condition, in the first place
 it will be necessary to deal with some fundamentals,
 which must be assumed irrespective of any manifesta-
 tions.

Modern Physics merely states, that Matter is indestructable and the quantum of Energy is finite. Adhering to the conception, that Space and Time must be infinite realities, but as to the why, Matter and Energy should be finite, we hear nothing, except that empirically it has been found to be so. Our theory has laid down, that the Design is to pack infinite space with infinite matter, hence our spacial units are constantly appearing afresh in Space and Time. We have thus set ourselves an apparently unnecessary difficulty, but as we assumed that a spacial unit intersists, we were bound by logical consistency to conceive that the spacial units were constantly created afresh, thus producing an ever-increasing quantum of Spacial Matter. This was entailed by correlating the action of our minds in Addition and Subtraction with the nature of things of the Cosmos. No justification can be found for locating in Infinite Space a point or points at which Spacial units were, according to this theory, created afresh; anymore than Modern Physics or Philosophy can lay down an absolute centre of Infinite Space.

Until physicists can weigh all matter and measure all energy, they are not entitled to assume as an absolute truth such are indestructable. They have no proof, that a number is infinitely indivisible. That number might be divisible to a definite ending, if the process were continued. Conception has always more weight than empiricism, which simple algebra will expose in its attempt to set itself on a level with arithmetic. The final card of a full pack can be predicted, but not if an unknown card has been previously abstracted.

This should shew the reader we are also entitled to be arbitrary in our idea as to the conditions of freshly created units in infinite space.

There is one theory concerning the nature of the Solar System, as manifested to us at the present day on the modern astronomical basis, which recognizes gravity as an action at a distance, and inertia as inherent to

mass, but there are numerous theories as to the formation or origin of the Solar System. Any astronomical observer is entitled to evolve a new theory from what he sees.

Meteorites which fall to earth are characterised by being intensely cold inside, rather indicating they engaged no friction outside the atmospheric envelope. What heat they may have had apparently radiated out into a plenum of no temperature; but this could hardly be so, in that all celestial bodies are casting into this plenum energy of some sort. The idea is, that this meteorite is a portion of the Solar System: I fail to see this, if we adhere to the present laws of gravity, since all erratic meteorites would have, ere now, been absorbed by the sun or planets or their satellites. If we look upon gravitational fields as I have indicated above, the constant appearance of these unconsumed meteorites becomes explicable. This must be evident, in that if we arranged a system of magnets in uniform revolution, the whole system would quickly come to equilibrium and any stray minute magnets could not possibly continue their seemingly erratic life. Shooting stars, ostensibly meteorites, behave in diverse ways, though they never shoot upwards from an observer's point of view: Surely these are erratic and, therefore, unconnected with a solar Gravitation system.

Partly for these reasons I am finiting the action of my gravitational fields, that means I doubt whether the Solar System is a single gravitational field, as is at present accepted.

To my mind, since we have seen that gravitational energy must be made conformable to the other types of energy, therefore this action-at-a-distance must be ruled out; and if so, there appears ample scope to reconstruct the solar system, so that gravitational energy will no longer be anomalous.

We are now prepared to imagine out the conditions of the fresh appearance of our units in space. Considering the solar system is arranged on a plane, that is all planets rotate and revolve in the same directions or

approximately in one plane, one is naturally inclined to think such are constrained in that plane by something. There is no reason why the planets should not have revolved round the sun forming orbits considerably more inclined to each other; and since this has not been the case, theorists can assume the solar system was originally a gyrating nebula, which through outward radiation of heat has condensed into what it is. But the reversed direction of revolution of the satellites of Neptune and Uranus are certainly antagonistic data, much as I have held the existence of the erratic meteorites militates in that direction.

If, therefore, our spacial units of gravity are being freshly created having lines of intersistence conformable to planetary motions, we can consider the solar system as being bathed in a whirlpool of these units, with each dense portion absorbing the substance of this whirlpool. Having in such a case no attractive force acting through a distance, unless the gravity units, as it were, drive the dense planets in any particular directions across the streaming whirlpool, there will be no signs of gravitating towards a centre. This can be roughly seen in a whirlpool of water. Here allowance must be made for the innumerable streams of water entering in from the sides of the vessel, in order to produce the whirlpool.

Now, if we consider the planets flowing with the extreme edge of the whirlpool, namely, Neptune and Uranus, and taking into account the extreme obliqueness of their satellites' orbits, it can be conceived their revolutions could be reversed. In that, if their obliquenesses were intensified, they would eventually revolve in a direction normal with other satellites of other planets.

The interaction of these spacial gravity units would not entail that they should be metamorphosed into some other form of energy. The interaction would be simply manifested as displaced positions, which, could we detect, such would appear to us as eddies in a whirlpool of spacial gravity.

There is, no doubt, that this all appears to be a very wild suggestion, coaxing the introduction of chaos, which we set out to avoid in our wish to reach the Reality. But on deeper reflection, as we have experienced a similar state of affairs in matters pertaining to belief, we should not be too hasty to condemn this product of imagination, and thereby discount the direction to which it may lead us to.

As long as abnormal deflections of gravitational lines are unexplained, and as long as intensities are at variance with calculations, anybody is entitled to dispute that a gravitational field is a uniform continuum. The abnormal gain of the Perihelion of certain planets has allowed Einstein to elaborate his theory of the Reality, in which he could shew the abnormality was consistent with his laws thuswise deduced. In that, he has partially succeeded, but only by mathematical deductions. It remains to be seen whether these deductions are really correct. We have no mathematics to lead or mislead us, we can only put the proposition forward with the most reasonable arguments in favour of what may later on be considered obvious. Kepler had a numerical correlation staring at him, but he never detected it. This may be the same with us; and simply because we have none, it might be unwise to discard this whirlpool theory at the outset and in the infancy of this theory.

From the above, it can be easily seen that each dense unit system would have a gravitational field in proportion to its mass, and that the mutual effects of gravitation of two systems would only behave mutually if the systems were equal. There would be a limit of mutual attraction entailed by the disproportion of the masses (sizes) of the two systems. Therefore, according to this theory, a stone falling to earth does not cause any accelerated motion of the earth, because the masses, are disproportionate. Whereas the moon would affect the earth but to a less amount than entailed by the present accepted law of mutual attraction. The moon, however, may be in an eddy of the whirlpool, for it should be noted

in pendulum-swinging experiments no compensation is made for the position of the moon. At present I cannot see why the moon is supposed to be the primary cause of the tides, and yet has no gravitational effect on the pendulum.

It is impossible to make any estimation of quantity in this direction at this stage. The task could only be undertaken after further gravitational experiments. For presuming the Design, as laid down is correct, we have still to empirically establish the laws of deflection of gravity. Experiments, so far, have only been conducted in reference to the permeability. One thing we can be quite certain of is, that the deflection of any line of inter-sisting gravity can only take place in close proximity to a dense system. An approximation of this could be obtained by weighing a sheet of glass or metal in the upright and then in the horizontal position, the differences however would be so minute that no ordinary balance could weigh such. Figures might be obtained by obtaining the intensity of gravity at various heights in mid-air, and comparing such with the influence of mountains at similar heights. For the present, in a way, we can take it that the influence and uniformity of gravity will be altered the further we recede from the mass or planet. For we have empirical proof, that at very close quarters the force of gravity does not obey the universal square of the distance law. Capillary attraction may explain much more. However the idea of the Solar System being a whirlpool has been given, giving each planet a limited field of gravitation, as a suggestion.

Presuming such an idea can be entertained without better support, we can look upon the meteorites as intersisting with the gravity units and appearing in our solar system. And further, we get a tolerably good explanation as to how these shooting stars continue appearing in such enormous numbers. The South West Monsoon of the Arabian Sea and the disturbances proceeding from it have always appeared to me of meteoritic origin. The cold of the hailstone and the intense cold of

the meteorite may yet be shown to have a common origin.

We have now another question to settle concerning the nature of gravity units. It is admitted they are freshly created. Can they therefore be totally annihilated under certain conditions? As long as they intersist in their lines of progression, there is nothing to suggest other than that they would continue to so intersist. But if, as is the case with a planet, they converge to a point the centre of the planet, though we have admitted such concentration must produce metamorphism into some other form of energy; yet the point is, does spacial gravity matter become entirely so converted before reaching the centre. If evidence were possible, we would be confronted with a problem of interaction of energy units. So far, uptill now, our attention has only been engaged in respect of the inter-action of energy and dense units. Naturally it is impossible to state any thing definite, but it worth bearing in mind, that total annihilation is not inconsistent with the nature of the Design, we have assumed. But it may be the nature of the things, that as the gravity units, being primordial units suffering fresh creation, they could undergo total annihilation. They certainly stand uniquely as being the only units, that can progress in intersistence through everything. Thus every mass, that can converge them to a centre, may be an eternal and absolute vacuum, in respect to these units. When we consider, that polarized light can be made to disappear by double polarization, in that there is no empyrical proof that such disappearance is accompanied by the fresh appearance of energy in an another form; and when we have also the disappearance of light in the absorption bands of the spectrum, such are adumbrations of that possibility. But for the purposes of this chapter, it is not necessary to enlarge on this aspect in elaboration, the matter will receive ample treatment in the future chapters. So for the present, the constitution of a gravitational field has been put before the reader, more with a view of shewing the possibilities, that the primordial units of spacial gravity are things of dimen-

sions, which apparently intersist in space, like the plenum of aether of modern physics; and thus will be called to account for far more, than is generally attributed to gravity in modern science.

The reader may think, I have substituted the aether plenum by spacial gravity; but there is this difference, in that aether is not recognised as a quantum of energy in itself. It is the carrier and nothing else. My gravity plenum is really a vast store of energy from which I intend to draw considerably, as will be seen latter on.

Note.—The following is entered as additional, in that this chapter had been written prior to the discovery, that Q. Majorana (Comptes Rendus 173, pp. 478—479. Sept. 1921) had clearly experimentally detected an absorption of gravity; and did not know, whether to put this down to experimental error, or to an error in his theory. The reader acquainted with the laws of gravitation will see at once, that variability of the gravity force, if it cannot be isostatically accounted for, must be either due to an experimental error, or that gravity is in reality not a force acting at a distance. A line of force under such circumstances is not composed of substance, and therefore cannot be deflected. For much in the same way, if Light is a modification of aether, and aether is not a substance, clearly this force could not be deflected by another force. There can therefore be no question, that if gravity is absorbed, it is energy or matter. Thus Majorana's experiments in proving our interpretation of a gravitational field assist us in proving this theory. It is obviously not necessary to dilate on the importance of the result of the above experiments.

Chapter XII

Transformation of Gravity.

In the preceding chapter we have seen that a gravitational field is in reality a nucleus of dense units interexisting in co-ordination, forming a system surrounded, as it were, by an atmosphere of spacial gravity units, which interexist in lines of progression converging to the centre of that dense system.

To better visualize this, we can picture to ourselves a liquid in which a body is immersed; and this liquid is continually flowing into the body, as if a continuous vacuum were absorbing the same.

Taking the earth as a system of units, it can in this way be at once realized, that the energy field enclosing this globe is extensive. Our gravity units can be viewed as corpuscles, possessing great velocity, impelling all free matter lying in this gravitational field towards a centre, entailing the deliverance of energy to the Earth.

If, for example, it were possible to cover the skies with free falling stones moment after moment, this continuous rain of stones would only give us a small idea of the energy lying in that gravitational field.

We do not perceive this energy passing through our bodies. But this should not appear strange. if it is borne in mind, that the passage of electricity through the body cannot be sensed. As a collateral example it can be stated, that if all matter were transparent to light, light radiating from the sun to us would obviously pass undetected; and only by deflection or arrest would we be able to realize being bathed in a luminous atmosphere. The unsensed Hertzian rays behave similarly much as Light: the passage is not felt and therefore could not be realized. If man had not the knowledge there was an atmosphere of dense air, possibly, he too would have

claimed that the motion of swaying trees was a case of action-at-a distance.

The object of this chapter is to shew that a gravitational field is really a store-house of energy, which is under constant replenishment; and that whereas modern physics and chemistry, in combination, endeavour to see enormous stores of energy in the atoms themselves, this theory intelligibly follows out the postulate, that what moves through space must occupy space; hence reaches the conclusion that energy occupies space, which debars us locating these enormous quantities in the atoms at any time.

Indeed I cannot understand what modern science is really striving at. At one time they take support in aether which apparently occupies all the space, that is not occupied with matter, and endow its modifications (whatever these are) with energy suitable for movement through space. At another time, they see locked up in an atom of the very smallest dimensions enormous quantities of energy; and then with one sweep somehow they convert everything into electro-magnetic units and fashion the electron accordingly. I admit that as I have divorced myself from the modern ideas of force and motion, I may not be capable of assimilating their ideas properly, and possibly may be misquoting them. But every student of Science expects the Reality to be simpler than the manifestations; and I, amongst many, look for the same; which can never be found even in the latest theories.

Either the electron has dimensions or it has not. If it has, then wherever it is, it must occupy space; and I take it nothing else can occupy that space at that time. Then we get the difficulty of knowing whether the electric charge is the mass of the electron or not. On top of this we get action at distance thrust on us (which nobody understands); and finally find electricity is composed of two distinct things, usually termed positive and negative, which, neutralized, form one of those potential energies that cannot be discriminated from nothing. What does this mean?

I would far sooner believe, that Rutherford has sprung a leak in my gravitational store-house of energy in bombarding dense units with helium, than think he has liberated fresh energy with a profit from, apparently, nothing. For my contention is, that whenever gravity is deflected, this energy then appears in another form. We can now proceed to shew there is much in support of that contention.

Mere contact of two different metals, like copper and iron, will produce electric disturbances, which are not detectable in either metal before contact. And more than this, an electric current allowed to pass through these metals in contact, shews liberation or absorption of heat at the place of contact, known as Peltier's Effect.

This, according to our theory, is a case of transformation of gravity energy into another form, which is known as electricity. Mere contact means, that the units of each system, iron and copper, interfere to a certain extent with their respective phases of intersistence continuously; hence the spacial gravity units to a very small extent are deflected and appear as a quantity of electricity. Whether we produce electricity by friction or heat by rubbing, in either case we are diverting a portion of our gravity energy, thus producing some other form of energy. The kinetic energy of rubbing in the reality is dense units intersisting, just as much as gravity energy is the spacial gravity units intersisting in lines of progression. There is no difference. The point is, that if we leave the architecture of the dense system alone, the units of gravity as it were, pass through it without that amount being deflected, subsequently produced by alteration of the architecture or co-ordination by rubbing or so forth: more intensely seen in the process of polishing. Thus can we see, that in the integration and disintegration of a system the gravity units become deflected above normal; and if the conditions are favourable, it is possible to detect the transformation of gravity by observing the heat and electrical disturbances which are thuswise produced.

Here, then, we can see from where an unlimited supply of energy can be obtained; and the profit will be greatest, when the necessary interference of the dense units by kinetic energy is the least. With a radio-active substance, whose architecture is such that gravity is being constantly deflected, we have conditions where the transformation can be effected without the absorption of kinetic energy; and we will later on find out, that the whole Cosmos is constituted as a transformer of spacial gravity in diverse ways. But such are always the same, in that the transformation of any energy is dependent on the architecture.

If the reader pictures a vast stream of flowing water progressing through a frictionless channel, it is easily contemplated that small side abstractions could never be measured by the diminution of flow at the other end. And so with gravity, the deflections are so minute compared to the energy in the gravitational field of our earth, that even if we tested the force of gravity below a slab of Radium our instruments might not be delicate enough to detect such within experimental error; but it is extremely probable that an absorption of gravity would be shown.*

Pendulum experiments comparing the force of gravity on surface with that below in deep mines could however shew the amount of gravity transformed into heat, etc. by calculating what the actual increase of force should be in depth and noting the balance lost. But as we cannot retain the heat for direct measurement, the transformation of gravity into heat cannot be accurately correlated: Could we do so, then we would be provided with almost detail information as to the incoming gravity energy.

To my mind every experiment in this direction is of utmost importance to mankind, in that direct harnessing of gravity will supply us with energy in all positions on this globe. And I can dimly foresee, that the quantity so liberated will transcend the water-power of this earth,

* The reader should refer to note at the foot of page 128.

which, uptill now, is our vastest scheme for conducting work in the absence of the finite stock of energy in fuel-disintegration and living activity.

No wonder then, that in the chapter on Cohesion this theory foresaw that chemical manifestations did not denote the existence of a special form of chemical energy ; and yet that conclusion was reached by quite another process of reasoning. Now we are in a better position to say, there is no potential energy buried in fuel, but that all energy derived from combustion is abstracted from the gravitational field by interference.

We need be no longer concerned about the difficulty scientists experience in trying to measure up the production of light from heat. Indeed, incandescence according to this idea need not be considered as transformed heat ; but it may be shewn that the interference of thermal units with dense units allows of gravity being deflected hence transmuted into the nature of light. And on such we are better prepared to shew that luminosity can be directly derived from gravity in the absence of terrific temperatures ; and more so this theory may be able to decide that Light is not Heat ; which our senses have always told us is not the case.

Many, if not all, of my scientific readers will be startled by these deductions which uproot the old idea of the Conservation of Energy ; but I feel they will be tolerant and grant that I have arrived at these results by fair means. I think so, because I know what I have myself gone through by strictly adhering to the basic principles. In looking back I can honestly say, I have no weak point in my mind, which I have left out hoping the omission might escape detection. Indeed my weak points have been repeatedly referred to, in that I have and do now deplore I cannot settle upon whether substance appeared in space in three rectilinear forms distinct from each other, or whether the ultimate units of all substance were originally one. Dense units, Energy units and the Vital units always appear to me to be distinctly different to each other, and yet I feel the Vital Units are

derived from Gravity: on this point I cannot decide. For, if the vital units are derived from gravity, the force of Triadism is apparently lost for the first time in this elaboration. I am loth to loose this, just as I am loth to introduce even one weak link in the elaboration.

If we now return from this digression to the subject matter of the transformation of gravity, we find that modern physics with force and motion is unable to correlate gravity as a form of energy with the other known types. Gravity to them is still a force, which can or cannot act on matter according to the conditions; yet at the same time, it is considered to be in action throughout the Cosmos for all time, yet the manifestations do not lend support to that idea. Dust, as everyone knows, appears not to shew any signs of this attraction acting through-a-distance, and only by means of electrical attraction of these particles are we able to devise means of promptly deposing dust from the atmosphere. Clouds hang up in the atmosphere, being spheres of water, they should descend; gases more than the liquids shew signs also that the gravitating force of matter to matter is not universally true; and finally we are taught, that at extremely close distances this attractive force no longer varies inversely to the square of the distance, but now varies inversely to the 4th power of the same. No justification for this alteration is even suggested, and a sceptical critic would be entitled to suggest, for great distances another variation of the force is equally possible. With our aeronautic experience we could go to the length of asserting, that a gravitational field away from dense matter is probably more erratic, than as ascertained by pendulum experiments; which always must be taken near dense matter. I understand that an air man can be flying some seconds upside down without experiencing the action of gravity. Airmen high up feel lighter in weight; or as they put it, more buoyant.

With us from the nature of the creation of these gravity units, it is possible to see how space may be devoid of these units, in places; which means, the space

is not part of a gravitational field. If so, there is no need to explain why all the stars and cosmic matter have not coalesced by now. We are dealing with gravity as a quantity ever on the increase in Space, which is only kept down by continual transformation into the other forms of energy, and as suggested into dense units; manifested as true matter possessing mass. In fact we see this being done on the large scale in the sun; and can presume this transformation is in progress in a weakened form, wherever dense units lie in a gravitational field. If we go to the beginning of things, this contention allows us of seeing Space being fed with gravity and nothing else; which means, in those days heat, light, and electricity did not exist. Therefore these latter forms of energy are all derived from the same units; namely from the gravity units.

And as said before we are not particular as to how Light is produced. For whether heat is there or not, to produce it, we can depend entirely upon the temporal and spatial phases; just as in the case of electricity, where such can be produced by mere contact or friction. An altered architecture can deflect gravity into light, without the intermediate production of heat. Crystallization produces usually heat, as solution does the reverse; there is nothing to prevent us in seeing that the former production is a transformation of gravity. If we could not see the crystals formed we might, as with radium, attribute this spontaneous generation of heat to something else. Though I do not claim that all of the heat of crystallization is produced by gravity, I consider it is mainly responsible for its production. The heat produced by capillary attraction is far more comfortably explained by transformation of gravity, than in any of the other modern suggested ways. The high temperature reached when some metals absorb gases is a strong case in favour of this idea of transformation of gravity; in fact I do not see how modern physicists are able to shew how this spontaneous generation of heat is to be accounted for. But at the same time the reader must not necessarily

confound this heat with the heat driven out a system, say by compressing a gas. Here we have to deal with heat occupying space as being pressed out of the system.

It will be seen, that it would be quite possible to prove the correctness of this transformation, if we noted the variations of Joule's determination of heat equivalents with those of gravity; for it stands to reason the weaker gravity is, the lower the result will be. The variations would not be great, but should be detectable. And now that we have deep vertical shafts and fast hoisting engines, I can foresee how such experiments could have these effects enhanced. Someday a less efficiency of liquid fuel will be shown to be correlated with diminished gravity in aeronautics.

Facts gleaned from Hildebrandt's book on Ballooning appear to shew, that temperature observations are not only very variable, but often appear abnormal. For instance, the temperature taken, during eclipse of the Sun and after, shewed no expected variation; and this was 12,000 feet high, and above a cloud bank. Then we learn, that the temperature of the internal gas of a balloon is generally higher than that of the surrounding atmosphere, and at night is sometimes less. Further, temperatures taken by some observers in definite positions do not correspond with those of other observers, who have purposely gone up to verify the former.

According to our theory it must be borne in mind, that not only will the ascending internal gas of a balloon, if restricted, suffer an increase in temperature proportionate to the speed of ascent, and vice versa, but that the mercury in the thermometer will be also affected in a similar manner. With this recognition of assumed conditions, it would be necessary to know the conditions under which the balloon was travelling. Thus a temperature taken whilst stationary could never correspond with observations at that point during speedy ascent or descent.

In the above mentioned book it is notified, that a balloonist ascertained during ascent his battery only gave 5/6th of its power. This diminution, if so, would be

explained by the diminution of gravity at that height, if taken stationary. So that when Guy-Lussac subsequently proved these observations to be false, he may have unknowingly made these during ascent, whereas the others may have been carried out during decent or when the balloon was stationary.

This should make the reader see that it is quite possible to ascertain the deflection of gravity from others factors, than from weight alone or absorption of gravity.

We are now in a position to understand what absorption of heat in certain cases may mean. For suppose we take a system of a particular architecture in a certain gravitational field, it stands to reason a certain though small amount of gravity transformation will be continually taking place. This heat will therefore be continually escaping as deflected gravity. As long as the architecture is not interfered with the amount under transformation is constant. All other systems at rest, excepting radio-active bodies, are behaving similarly. The heat is equalized, so far as the thermometer is concerned, by radiation and dissipation. Now just as crystallization can interfere with gravity, and thus transform it into spontaneously produced heat over and above the normal amount; solution can reduce this normal amount, which to our thermometer would indicate a reduction in temperature. Physicists would say heat is absorbed, we can say gravity is not transformed into heat at the original rate, hence less radiation and dissipation of heat. But we are not as yet prepared to show, how heat can be deflected and reformed into gravity. As an illustration, or even, as an example, we can take the case of light passing through a grating. By altering the latter, more or less light can pass through the meshes; for in this example the transmitted light is comparable to the transformed gravity. We need not view it that light after its passage through is absorbed, but that its production it decreased.

Specific heat and latent heat disappearances in this way seem now more intelligible; which means the introduced heat interferes with the architecture, producing a

variation in the transformation of gravity.

But it must be always borne in mind that our terrestrial gravity energy in amount transcends anything possibly conceivable; and that therefore these interferences mentioned are but slight deflections, a point which must always be borne in mind.

If we heat a piece of tourmaline, it shows, only within certain temperatures, electrical polarity; when in that state the crystal is broken each part shows similar polarity; and finally on cooling it loses its polarity which eventually becomes reversed. Surely this is a very clear case of the transformation of gravity into electricity by the interference of heat with the architecture with the ordinary acceptance of two kinds or signs of electricity. The mere breaking would not alter the polarity; and one half should remain one sign and the other half the other sign.* Then again by loss of heat we produce additional electricity. This it must be admitted is quite contrary to the law of Energy Conservation. For why should the polarity disappear on cooling, and reappear reversed on further cooling?

The same remarks apply to a magnet of steel. Breaking in half will not isolate the the two poles. Hence the modern idea, that a magnet is composed of smaller magnets, which are supposed to rotate about in a very curious fashion.

So I would have it with life, the embryo is but a broken portion fed by gravity. We can also take sustenance from the fact, that a lizard's tail is kept alive owing to its being in a gravitational field; and that a frog's heart continues pulsating for a long time after removal from the body for the same reasons. The organs of a human body die after the death, as certified by medical men, at different rates: According to us, they live being sustained by gravity and seperation does not spell immediate death. This of course is quite common in the vegetable kingdom, in that a severed part behaves often

* Considered electrostatically.

more responsively than the seed. Take away gravity and nothing will live: growth is impossible.

Thus we learn, that kinetic energy is merely a dense unit interfering with another dense unit of any system developing heat and so forth in that they both are bathed in a gravitational field. Oil prevents the interference. Modern physics says, this is lubrication, which prevents the transformation of kinetic energy into heat: meaning, apparently, that the molecules are not set up in vibration.

From the foregoing it can be gathered that much of the loss and gain of energy can be ascribed to a gravitational field in which necessarily all our experiments are made. Yet it is admitted that it is not clear, as to whether energy units, such as of heat and electricity, can by alteration of the phases of intersistence reappear as gravity units. We feel however certain, that even with inert systems gravity is being constantly deflected into heat and possibly also into electricity, and that a change of temperature could be produced in either direction by alteration of such deflection. But we have to be careful in estimating actual heat units put into a system, as apart from those produced by gravity.

We know that with the elements, the specific heat varies inversely to the atomic weight, and that the atomic weight and the architecture must be correlated. Even modern physics agrees on these points. Then since radium, with an extremely high atomic weight, can be considered to deflect the greatest percentage of gravity of all elements, carbon at the other end of the scale, as an example, would deflect less gravity; and on the contrary heat would be reconverted into gravity to account for the high specific heat of that element. This could be experimentally proved by having weighments conducted under covers of different elements possessing diverse atomic weights. With carbon we have an element the specific heat of which varies from nil to a high order; hence the temperature of a carbon cover might elucidate what here is intended to be proved.

Except in the case of a few examples the weight of any body is, to all intents, absolutely constant; so that if we can rely on this, deflection or increase of gravity by any medium can be ascertained by a balance, if sensitive enough.

There is no question, that if this idea is correct, the mass of new experiments will be directed in measuring the force of gravity under varying conditions; and it is highly probable that the action of gravity near Mass will be different to that far removed from Mass. This is easily to be accepted, in that Modern Physics has shewn, that the force of attraction at grazing distance is enormous. Direct experiments in the latter case may be difficult, but indirect experiments, like solution of salts or chemical action, might be tested in air-machines where gravity is removed from mass. The human body, a very sensitive instrument, could tell us much under these varying conditions, but quantitatively could tell us nothing; yet it could suggest in which direction experiments should be made.

Note:—An airman of considerable experience has testified to me, that the common burning sensation in the skin appears to originate during ascent, and thinks such would not occur with slow rising; and certainly does not take place during descent. If we take the modern view, that such is produced by alterations in atmospheric pressure, we could suspect, that this particular skin sensation, appearing during sudden ascent, would re-appear on diving. According to us in ascent we produce heat, and in descent none at all; it therefore stands to reason, the burning sensation has in this way a better explanation.

Chapter XIII.

Radiating Energy.

The difficulty with radiating energy, such as light, is that any luminous point in space without a background is visible from any and from all points considered to lie on the surface of sphere, the centre of which corresponds with the luminous point. And so far as can be established empirically, there is no point on the inner part of any such sphere, no matter what size, that is not illuminated; but if the size of the sphere should debar one point in it being illuminated, it happens that under those conditions none are illuminated.

This is a case of ordinary diffusion of light certainly recognised in physics, but eliminated as unessential in optics, when dealing with hypothetical particular rays of light.

Now, if the inside of the sphere is self-illuminated at every point, say by making it white hot, it can be empirically established that any point within the sphere can be illuminated by, what is termed, diffused light. (I should define diffused light as that which can throw no shadow) Clearly then each point of the illuminated inner surface of the sphere must be sending innumerable rays in all possible directions within the sphere; and if the inner centre point is also self-luminous, it is also dispersing rays of light at the same time in innumerable opposed directions.

If "innumerable" is a quantity, on expanding the sphere, containing a central luminous point, these innumerable illuminated points must separate wider and wider apart; and the spaces between such extended points would not therefore be illuminated by the central point, which is contrary to experience. Planck in introducing the idea of quantum lines of light energy seems to have neglected this obvious result; for it is patent to all,

that stars at enormous distances are always visible, no matter how little or how much we shift our eyes away from the first line of vision. In other words luminosity appears continuous.

Here then, if anything, we have a continuum of effect; and if we choose to deal with light on the corpuscular basis or by the aether transmission theory, we have indeed got something overwhelming to deal with. It is all very easy to take one ray aside, and examine it as has been done so efficiently in optics, but to base any theory thereon, neglecting all the other innumerable rays, is not strictly scientific.

One almost feels inclined to think one only sees a luminous point, because we happen to be looking at it; which means light only radiates in any particular direction, because in that line there is some matter to receive it. Even scientists are concerned with energy radiating out to infinity, which means total dissipation of energy and from a common sense point of view practically amounts to annihilation. To hold the above idea as feasible seems impossible in that the velocity of light is a measurable quantity; but if the transmission, (we have no other word) of light were instantaneous, the above idea is feasible. In that case light in reality is not transmitted, it appears instantaneously wherever matter happens to exist in infinite space.

The aether theory appears to take up too much room to explain the transmission of light as put forth. I think the theory originated after the wave theory of sound: probably both were suggested by the ripples produced on the surface of water. It was a happy idea, in that it could be seen that kinetic energy could be transmitted through space without translating the intervening matter matter or aether. But it was also an unhappy idea, in that the work done every moment appeared to be on the increase without absorption of energy.

According to our theory, kinetic energy is not energy in the sense we assume heat, light and electricity to be. That is the insistance of any spacial unit to interisist is

force not energy. If therefore we wish to transfer energy from one body to another we must move our energy through space. Hence in moving matter through space we are moving energy, since a dense unit and an energy unit are of one substance of volume and persistence. Only in this way can the energy of sound be considered to be transmitted, in that the first dense unit intersists reacting on the next unit and so on. The original unit is therefore not intersisting in a line of progression, as would be the case with a stone falling to earth.

The aether theory which had no real translation of energy in the sense of a stone falling, but assumed something occupying space endowed with only molecular movement restricted to no dimensions of space; that is though the molecule of aether moves too and fro side ways it had no size: which rather sounds like as if aether did not exist. And I may here mention, that this ambiguity finally led to a dispute, as to whether aether moved in mass with the earth or the earth moved through the stationary aether: ending in, that it did and did not.

We have been careful not to identify our spacial units, because legitimately we cannot owing to annihilation succeeding the appearance phase; therefore it is immaterial to the theory, whether all the spacial units, manifested as the cosmos, are fresh creations each moment or not. If there is a law, which recognizes identity, entailing the reappearance of a unit in the same position or any other position, we are not entitled to rule out as absurd any distances of reappearance as might occur. That is, if a unit can reappear the millionth of an inch away from its preceding position, it can reappear a million miles away. But we firmly adhere to the assumption, that every unit has volume and persistence.

As this theory assumes light to be in reality spacial units of definite form, volume, and persistence, we cannot do better than set about in explaining diffusion of Light: one of the most difficult manifestations Physics has not dealt with.

We are loth to introduce any new assumption; for experience has taught us, that in modern science this casting about for tentative and subordinate theories has never as yet led to anything conclusive. We will therefore try, at least, to obtain satisfaction with our original fundamentals.

Now supposing we had a spherically shaped mirror the surface of which really consists of a number of small plane mirrors, and we allowed at first one ray of light to fall thereon; placing this mirror in the centre of a spherical room, it is easily discernable that if the ray of light were narrower than each small mirror only one spot of light would appear reflected on the spherical roof or wall. If now we rotate the spherical mirror according to the positions of the subsidiary plane mirrors, we would perceive in succession a number of luminous streaks on the roof or walls. In this way can one ray of light be dispersed by reflection in a considerable number of directions: not as mere spots corresponding in cross-section to the ray of incident light, but considerably more extended in appearance, likes streaks of light to our eyes. Further, if the ray also underwent a quick succession of movements to a small extent the reflected luminosity would be enhanced.

Seemingly, (I have been unable to experiment or submit to calculation for a result), conditions could be reached in that the whole ceiling could be illuminated; if not by one rotating compound mirror by a small number of them, provided the incident light falls on all and the speed of change of posture were inordinately high.

If the number of incident rays are increased and have various directions, the effect must be considerably increased. This will shew the reader, that the effect produced by a self-luminous point cannot be the same as the effect produced by an illuminated point; in that in the former case, there are no incident rays to be reflected. And further assuming on the basis of our theory, that light is a series of spacial units intersisting progressively, we have not reached that stage of knowledge as to the

nature of the emanations from a self-luminous body. That is, we can see that by reflection of light we are obtaining discontinuous emanations, taken by our eye to be a continuum. but we have not ascertained that this discontinuous emanation is the nature of self-luminosity. We can however reach a partial understanding of the nature of the latter condition, if we bear in mind, that an incandescent globule of something gives uniformly intense light in all directions. If, then, the emanations were continuous from each point of luminosity of that body, there is considerable likelihood that from the nature of the substance all points are not equally intense in luminosity. Whether such would be due to the emanations from one point travelling transversely to the other emanations of the neighbouring points cannot be laid down. For the present, I am more inclined to think that self-luminosity is therefore also a discontinuous type of emanation.

The tendency is to treat a luminous object as one emanating light in steady lines in all directions, but this must undoubtedly be an incorrect way; in that, as shewn in the previous part of this chapter, if these steady lines are projected far enough, they must have dark spaces between them, which we know is not so: otherwise the lines must be in the nature of cones. But, we are not entitled as yet to believe, the discontinuity under the reflected conditions are the same type of discontinuity under the self-illuminated conditions.

The conditions as illustrated by means of the compound mirror in rotation can be rendered thuswise in the reality: assuming dense units are compounded together to form a system in co-ordination, as laid down in chapter on Form and Posture, we have every rectilinear unit intersisting in different postures. We have, therefore, only to find out the law, which will govern the interference of insistance of a dense unit with a light unit for the conditions under reflection; as well as the law, which gives the direction and conditions of the light unit intersisting in a progressive line out from a system of dense units.

I have little doubt, but that the already established frequencies of light and wave-lengths will be (possibly not in my time,) shewn to bare correlation with the phase periods of intersistence of our spacial light units: That is, when we are able to lay down a data dimension of the volume of a unit, in addition to the unit of time of persistence and decide on the form. If our theory is a true construction of the Reality, there is no reason, why we should not try to arrive at those results by fair guess work. We have our metre and second of time fixed for all time,—at least such is our contention, though at variance with the ideas of others. I must not be severely blamed for adopting this method, for after all it is hardly fair to delegate all the dirty work to others.

As we are adopting virtually a corpuscular emission theory of light, we can feel quite certain that the system of white light must consist of a multitude of units, each representing, as a quantum, a definite light of a particular wave length. According to data determined by diffraction on the aether theory basis, the average undulations of light per second amount to approximately 500 times a million times by a million, which in round figures is 500,000000,000000, and during the performance of these undulations light is said to have travelled a distance of 12000 million inches, which makes each undulation about .000024 of an inch long; shewing, that the velocity of light is directly proportionate to the product of the wave length into the number of undulation: really giving us the idea, that the undulations are measurable in the direction of light, like the undulations of sound, which take place in the direction that the sound is travelling. If this were so, then the molecules of aether would possess size like the molecules of air. These conditions cannot be accepted, in that light can be polarized in in two planes at right angles to each other; hence the undulations, perhaps better put as oscillations, naturally had to be considered as vibrations transverse to the direction of the flow of light.

The wave length of light, since it takes place in a

plane transversely to the direction of light need not in this way necessarily have any connection with the velocity of light. The distance of each plane of transverse vibration to the next, however, would have connection. Speaking from their figures, this distance is equal to the wave length. Thus if we take the wave length as equal to the diameter of a circle, we can put 5×10^{14} circles in line as being a second's work in propagating light through space.

We cannot question the determination of the velocity of light, which is 186,000 miles per second; but we can question the frequency and possible the wave length. It is not at all clear, what is the wave length in physics. We have the Hertzian waves of wireless telegraphy placed from 12000 metres to a few centimetres in length.

Seemingly such are measured in direction of line of propagation. Light waves we know, are measured transversely. The former thus again appear as in the nature of sounds waves, which are measured in the line of direction.

If, now, the reader realizes this for one wave length of light, what about all the innumerable other units or rays of light which have different wave lengths, but are always all compounded together to manifest to us white light? How are all these different moving parts of aether going to be crammed into one position? We can say almost in one point of space of one dimension, which is a line. And then, if the reader takes all the rays of diffused light, as mentioned in the example in the early part of this chapter, a product will be obtained transcending the powers of imagination. Truly Aether can only be but a centre of creation and annihilation: we do not mind this, as long as we are not asked to conceive a thing as going backwards, when it is going forwards. Division we know can be extended to infinity, so that we have no fear the unit of time will be annihilated.

Indeed, it is absolute essential to have sufficient room for the appropriate number of aether units, electrons, or other modifications to allow of the transmission of the long

Hertzian waves, ranging from 12000 metres in length to a few centimetres, simultaneously with all other known rays diminishing in wave length to even less than $\cdot 00002$ millimetres. Strictly speaking, the aether theory must be provide for waves ranging from 12,000,000 m.m. to $\cdot 00002$ m.m ; which means from 600,000,000,000 to 1'0; in that the conflict of various waves in progression transversely and opposed is not generally admitted, though the slight differences in wave length, as with diffracted light, are admitted.

We are assuming, that there are at least 600.000 million different waves in this way, which could all be simultaneously in action at one point in space. This is not an erroneous assumption, though hardly a likely fact; but as long as, even, light can shine in two opposed directions it is impossible to believe the same aether units, electrons, or otherwise can be incited by opposing stimuli at the same time. There must be something wrong in the nature of aether; or else the formula, that the wave lengths into the frequency is equal to the velocity, is at fault.

Our theory provides ample room and only endows each unit with its own intersistence phase. And concerning light, naturally, we require less units than those 600,000, million varieties; though at this stage it cannot be laid down how many there are. But they are units, that is quanta, and their number must be definite and eventually determinative. It will be a mistake to think that in a line of progressing light units under our theory, the distances of reappearance or loci of intersistence must be extremely minute, as it is supposed to be the case with the length of vibration of light in modern physics. We have the enormous velocity of light to assist us; besides the duration of time of appearance which may be diminished by division considerably.

If, we now try to follow out the behaviour of our light units, since white light undoubtedly is composed of a number of units, it rather appears that the average rate of progressive intersistence of each unit must be the

same. In physics we are taught otherwise, though all light has the same velocity in vacuum such is not the case in different mediums; for if this were not so, the refrangibility of light could not be explained. But I doubt, whether this explanation of refrangibility is even correct on the aether theory basis. For if red light has a different velocity to violet light, say, through water, in that case a momentary flash of white light would reach the observer as a twinkling light: This effect I think could be detected by measurement, but I can find no reference thereto. It is not surmised that we could get a twinkling effect in short distances at our disposal, but if the velocity of white light can be measured, the same can be done for coloured light. Thus, though the refraction of light may receive explanation by the diminished velocity of light in passing through denser mediums, the refrangibility into the various colours is apparently merely a hypothetical assumption. If we introduce the amplitudes of light vibrations and assume such are longitudinally undulatory, then the refraction and amplitude or intensity of light should be related. So far also I can find, there is nothing in corroboration of this.

As there seems to be considerable doubt in this direction, though we can accept the empirical results, that the velocity of the light is retarded by dense mediums; we need not take it, that the different colours of light are unequally retarded.

For the time being it can be laid down, that the visible rays of all coloured lights are spacial units of one form and one size. It would be too complicated to work out the behaviour of different units, though it is possible that the differences in the units may be connected with the marked differences in the colours of the spectrum: At present, I doubt this.

We have now to tentatively assume, that the posture of any unit is in co-ordination with the line of progression of its intersistence. We will likewise imagine the loci of intersistence are equally distant for all units composed informing white light. This, be it noted, is only done for

simplifying the description of the behaviour of the units, though it is quite probably the correct interpretation.

Let us take a light unit to be, for simplicity's sake, the cubic form, and the dense units of the medium to be also cubical. We have already decided that the dense unit has changing posture, which we will and must grant also to the light unit. For convenience of illustration it can be taken that the light unit is moving in jerks, and the dense unit is changing posture in jerks also. Presuming all the light is reflected in dealing with only two units interacting, we will take it that the direction of reflection is determined by the relative postures of the two units of light and dense matter. This can be derived, if rectilinear units are used, but not so with spheres. On each impact, as it were, the conditions are altered; hence the reflected unit takes diverse directions. If now we rule, that certain conditions of impact or conjunction determine absorption of light, then it stands to reason the reflected units will be minus certain members of the series. This means the reflected light now becomes coloured.

In refraction it is easily seen how all these different postured units of light, in passing through the cubical units of the dense medium, can be dispersed in an orderly way; and thus anomalous dispersions can be accounted for, which cannot be explained, if we adopt the velocity determination method for ordinary refrangibility.

In this way we get a selective method resolving white light into its components by the postures of units in the series. That is, as long as our light units are intersisting progressively in one line, the cross section of which is equal to the cross section of the cube of light, without that interference all units, no matter what posture, are white light: Hence the differences in colour are only determined by subtraction of those units of a definite posture by interference. The intensity of light naturally decreases in proportion to the abstractions. This can be seen to be the case, in that colored lights are never as intense as the original white light from which they are derived. A vertical incident ray of light on glass receives

about 8% reflection, 1% absorption, and 91% transmission. But the shades of intensity of white light are determined by the number of units intersisting in a definite position of space measured in time.

With us the intensity is a measure of the quantity of energy, just as temperature is the measure of heat; and more we are virtually treating reflected and refracted light as representing one type action. That is, in the words of the theory, the interference of the intersistence of the light and dense units explains all optical phenomena.

Polarised light must mean absorption; and tends to shew that that each unit of light has two postures which can give the coloured effect by interference as in reflection and refraction. Consequently in partial polarization we have definite postures absorbed, immediately suggesting that absorption by polarization is probably a selection of light units in "groups." And since the angle of incidence for reflected polarized light is a definite angle varying only for differences in the constitution of the reflector, yet conforming with the angle of refraction otherwise termed the refractive index of the medium, we can see that this should be so, if the reflection from glass, we will say, is not determined by the plane of reflection, but by the postures of the dense units forming the plane of the reflecting glass. Metals, which are decidedly opaque to light, reflect light without allowing any light unit to intersist skin-deep in the medium; hence light is not polarized by reflection from metallic surfaces. It thus appears a metallic reflector is a plane in the true sense, giving greater intensity of reflection in that the selective absorption of light units is extremely small. I cannot ascertain how the Aether Theory explains this difference of reflected light in respect of polarization: One would think, all reflected light, according to the wave theory, could be polarised no matter what be the nature of the reflector.

The Aether Theory of Light has a sort of provision, that aether permeates all substances, dense or otherwise, and is retained for transmissive purposes. In this way,

they get light through a solid, without calling upon the molecules to do the work. With heat it seems otherwise, and with electricity the problem of conduction is not by any means clearly decided. If glass transmits light, this aether theory does not explain why it is also reflected. They take a solitary ray at one moment, and refract it inwards into glass; and at the same moment reflect the same ray from the surface of the glass, but do not shew what decides whether it be the former or the latter effect. All is based on the velocity of light so far as refraction is concerned, and reflection has merely the emphyrical knowledge derived from mass action of a wave of water suffering reflection. Surely reflection from glass and refraction into glass are correlated: signifying the medium has more to say, than it is admitted to. This is so, in that the angle of incidence and refraction are correlated.

It seems to me, that physics is not quite clear to the nature of the vibrations in aether; and, as mentioned before, there must be vast differences in the working out, if the vibration is taken transverse to the direction, or as a wave of propulsion, as in sound. The amplitude has never been taken into account in working out the method of reflection and refraction. Sharp intense sounds have a higher velocity than less intense sounds, which has been empirically established. Hence if the amplitude of light cannot alter the velocity of light, clearly the nature of the vibrations of light must be different to sound or wave motions of fluids: Then if so, we again come to the question, as to why the frequency multiplied by the wave length should have been made equal to the velocity of light.

We have now reached a point from which we can review the subject. As our theory depends on the postures and positions of co-ordination of the units of spacial matter, if the insistance to intersist is interfered with, one of the opposing units will find a new position. In the case of Light, this is Reflection or Refraction. It might be supposed, that the dense units of glass would vary in posture according to the direction of section made

of that homogeneous mass ; but on the average the effects would be the same, especially in so far in that we have assumed the postures of the units to be constantly varying. But we can foresee a clear explanation why the angle of incidence should govern the per-centage of light reflected, absorbed or transmitted. This shewed that the incident ray must enter skin deep before reflection is possible, in order to partake of the nature of the glass. This is seen in X-rays reproducing the molecular construction of the element and atomic arrangement of compounds. As an illustration : the stone skidding over the surface of water can be cited ; the shape of the stone determines whether it will enter the water or skid : of course the flatter the angle the greater per-centage of reflection. Even here we see that the revolving posture of the stone determines its history.

If we review the manifestation of polarization, it can be seen at once, that the aether theory is deficient in explanation. For assuming the vibrations are at right angles to each other, forming a cross in section, as long as one arm is parallel to the reflector we can understand half polarization being effected ; but if neither arm is parallel to the reflecting surface, it can be safely asked, what happens then, even though the incident angle is correct ? We are in a better position to explain full and partial polarization, having the varying postures of the light and dense units to help us ; just as much as such will help us to explain per-centage of reflection and transmission. And we can add here, that the double refraction of light by certain crystals can be absolutely based upon the behaviour of our units as described. Not having decided as yet as to the form of our units etc, the reader cannot expect more than an imaginary contemplation of the real conditions.

With rotational polarization, we should have no difficulty. The material of the medium does this for us, and we can get what colors we like, provided we agree that colours are only manifested by interference of intersistence. With us, if there is no intercepting medium,

there can be no colours. Indeed we have a great advantage over the æther or allied theories, in that, for this example, we have taken all our units of light as being similar, and have relied on posture and interistence for differentiation. We are not therefore confounded with 600,000 million different things.

At one time in elaboration I thought Light would be insurmountable in respect of diffused light, as discussed in in the early part of this chapter; but by having a series of light units all of different postures, the difficulty of overcoming this and producing colors was possible. Just as a string of a harp must vibrate a number of times before that a note is heard or can be detected by a resonator, so must a number of units of light interist in progression before any chemical or optical response can be made or felt. We thus only see white light as a full series of units, and coloured light as a depleted series; and we do not base dispersion of these units by the method of velocities. Finally, we are completely freed from answering the question, as to whether white light is a simple vibration or is an un-imaginable quantum containing all the innumerable wave lengths and frequencies of the spectrum. How physicists manage to handle this heterogeneous substance, I can never make out. They seem to have got into a tangle, in that a host of things are all behaving differently at the same time in one place. Nor do I see how they can explain *abnormal* spectrums without further confusion.

We now come to the production of the spectrum of light. If the units of light are all similar in form, but differing in posture, it appears that white light need not necessarily be composed in all cases of a series identically with every other series. Two complementary colours we know can produce white light in the absence of other colours; hence we have license to assume that the postures of light units in a series may vary, and yet produce white light say in reflection on simple incidence. This is an important assumption, and is in agreement with a very old idea of mine, generated long before this

theory took shape, that the heat of the sun was different to the heat of the fire; although both registered temperatures similarly and ostensibly shewed no difference in nature. But I was convinced that the effects of a sunheated bath were different to those produced by fire-heated water. India I think is a thorough disbeliever in regulating the temperature of bath water by the method of mixing. From the above assumption based on the constitution of white light, there seems some foundation for this idea.

Now we learn this: that refranged light is partly due to the medium of refraction and partly due to the composition of light undergoing refraction. We also know that if the luminous body is approaching the medium of refraction any particular part of the spectrum appears displaced more towards the violet side, and when the luminous body recedes, such takes place towards the red end. Thus increased velocity of light gives it a higher refrangibility as compared to a decrease in velocity. If for illustrative purposes, we view refracted light as units entering a medium, representing a plane inclined to the incident direction; it stands to reason if the nature of refraction is displacement, the greater velocity of incidence of a unit would increase that displacement. Now increase of velocity in the Reality is increase of the distance of the loci of intersistence; the time phase remaining constant. It can also be arrived at by speeding up the temporal intersistence and keeping the spatial intersistence or distances of loci constant. The latter would mean increase of spacial matter in a given time, the former would be a case in which the spacial matter is constant. So far, we have never altered the time phase of a unit, but all has been built on the assumption, that increased motion corresponds with increase of distance of loci; therefore for the present we are bound to give increase of velocity of light a corresponding increase of distance of loci for any spacial unit, which includes light. Clearly then this entails increase of displacement when intersistence is interfered with, which is in correspondence with the displacement of spectrum lines.

When we throw light on a coloured body it was held, that certain units of light of certain posture at the point of incidence were severely displaced, as it were thrown out or possibly metamorphised into another unit of energy. With refranged light no units are permanently thrown out, but are displaced according to their postures at the point of incidence in the refracting medium; hence what we see on the screen are units of light absolutely similar in form and intersistence phase, except that their postures in relation to the postures of the units composing the screen determine the colour effect. Thus at the red end, for example, the units intersisting in series have practically all the same postures. Had they different postures they would produce white light or some other compound colour. No wonder then, if we alter the surface of the screen in substance we alter the conditions of interaction between the light units and dense units, which is manifested to us in visual effects. The same could be reached by using some medium in front of the screen, which had the power to alter the postures of those particular light units. In this way we can get, by using solutions of indigo or permanganate of potash and other things as refracting mediums, abnormal spectra; and in a similar way, it is possible to render visible the units displaced beyond the red and violet limits.

Thus the intensities of colours of the various parts of the spectrum simply means, that more units of absolutely similar postures intersist in constricted positions, which is in accordance with our general definition of intensity.

The absorption black lines of a spectrum are formed at the source of light, and are thus characteristic of the nature of the substance emitting the light. At present we can only presume that absorption really means certain units of the series forming white light are thrown out permanently by the vapour of the substance, before incidence on the refracting medium.

Polarization is undoubtedly the act of throwing units of light out permanently, since up to date nothing can reconvert total polarised light, which is darkness, into

light again. Hence, I am inclined to think the dark lines of the spectrum represent a permanent effect; and very much doubt, whether means will ever be found to convert that darkness into light again. Therefore, for the present, we can define blackness as being substance devoid of light units intersisting in progression. This is rather necessary, if this theory is to be consistent; since we rely entirely on displacement by interference. A unit intersists, that is, it is and it is not; and as long as it is not in appearance it cannot be in appearance at the same time. We are not going to deceive ourselves, into believing that a thing can move in one direction at the same time it is also moving in another direction; but we allow one of our units to appear where there is no unit, even when co-ordinated to to form one system. Thus in an earlier chapter we refused to accept the reality of resolved forces or motions. Our unit can only insist upon reappearing in one position at a time; there is no chaos in this respect: For the beauty of this theory is, that the units of insistance are really the units of forces, and our units or loci of position is motion; hence neither forces or movements can really be resolved into components. The Aether Theory utilizes the hypothetical power of resolving motions, apparently not recognizing the fact that to resolve one motion into two, it is necessary to divide that which is in motion into two parts. I think this is entirely due to viewing motion, and we can add force, as continuums. This slight digression is necessary, in that I wish the reader to realize that in Light we are not dealing with interference of movements or forces, but only with interference of intersistence of spacial units. True, a light unit might interfere with the intersistence of another light unit, but from the fact that light units are all similar the the appearance in one locus of a light unit by another unit can never produce darkness, that is no light.

Diffraction of light entirely depends upon what may be termed surface deflection. That such is a fact can be easily seen in holding any opaque body between the eye and the surface of light. If the former is moved so that

one edge covers the direct line of sight, it can be moved slightly further, and yet luminosity is detected. If the edge of the opaque body is viewed through a pin hole this effect becomes more marked. In a later chapter this will be dealt with more fully, but for the present it is sufficient to say, that intersistence of the light units are interfered with by the intersistence of the dense units exactly similarly as with reflection and refraction. Whether absorption takes place cannot be decided in the absence of necessary experiments; in that I do not know whether diffracted light shews any polarization. We thus learn through diffractive phenomena something about the loci of intersistence of a dense unit, to which we have referred to in a previous chapter in reference to the character of instability of an ordinary top. This meant a dense unit has two or more loci of intersistence which is manifested to us as rest. The reader can follow out the train of events by assuming incident light as having, during that stage, a permanent line of progression; and the dense unit none. This permanent line of light could be made to pass any dense object without diffraction at all time. But owing to a unit of the dense matter repeatedly appearing in a position coincident with the incident line of progression, interference of intersistence takes place, hence deflection. In this way composite white light is refracted, as it were, in diffraction.

It can be roughly seen from the foregoing, how this theory is going to deal with optical phenomena and all forms of luminosity in the absence of heat. We are not going to hold conflicting views of the nature of light or any form of radiation, since we have taken all to be spacial matter interexisting. There is no need therefore to have heat in one instance as aether in motion, and in another instance as a molecule in motion with the impossibility of identifying matter and aether. Nor are we going to have trouble over the nature of colour, which had perplexed man for so long; for we can alter one into the other by interference of intersistence without the absorption or generation of energy.

Chapter XIV.

Electricity.

In the chapter on Modern Theories it was seen that there is a certain amount of ambiguity as to the nature of electricity in discussing the correlation of the various electrical manifestations. The potentiality idea would make us view electricity in nature as a fluid substance, which by means of conductors, instead of pipes, could be made to shew a difference of pressure by means of which work could be done. The polar charge idea virtually was to retain the idea of potentiality, but correctly speaking it was based on the assumption that there were really two kinds of electricity; and on a further assumption that it was in their nature not only to shew forces of attraction and repulsion, but it was also in their nature to amalgamate and produce thereby something, which strictly speaking could only be recognised as nothing.

But since electro-statical charges in conductors behaved as electricity of different potentials, the confusion of both ideas was entailed, and the result is what we have seen. This theory hopes to bring about a reconciliation.

There is nothing to be gained in hesitating about deciding about there being only one electricity or two. In the reality it is going to be either one or the other; therefore we can lay it down, that there is only one electrical energy, and set ourselves the task of shewing the reasons, why on the contrary there appears to be two forms.

It will be agreed, in the first place, that a current of electricity, say, in a conducting wire, is something moving; and though its motion is not perceptible, we can indirectly recognize such by definite magnetic phenomena produced thereby, which produce movement of bodies that can be measured, or are, as it were, tangible. The galvanometer thus indicates a current flowing as well as

the direction in which it is flowing. In any case it distinguishes between the directions of reversed currents.

Now, it can be experimentally proved that any conductor charged positively or negatively, if earthed by means of a wire, will enable that wire to shew that a current has momentarily passed through it in a certain direction by an indicating galvanometer.

Our present contention is, that in either case we are dealing with the same substance, which from the nature of the conditions, flows from the conductor to the earth in the one case, or flows from the earth to the conductor in the other case. Adopting the potential idea and illustrating such by liquid pressure, we get the conductor in one case behaving as a vacuum, and in the other case as a pressure. The earth behaving in a similar way, though the correlation is reversed.

We can understand the conductor behaving alternately as a vacuum or pressure, because we are altering its properties. But such is not the case with the earth; for if it sucks in electricity in one case, how possibly can it discharge it in the other case.

Clearly, the idea that the earth is at zero potential is a sound idea, which enables it to receive a current by outside pressure, and deliver a current to another body of a lower pressure than itself. Text books make much of this illustration, and I think practical electricians universally adopt this view of potentiality. But it does not explain electrical repulsion, though it may show how attraction is produced.

For, if a liquid in any system is in hydrostatic equilibrium, there can be no motion; whereas, if there is no equilibrium, which corresponds with difference of potential, motion is possible: and we can devise it that this motion can in nature appear as attraction. Clearly, the pure idea of potentialism of electricity must be ruled out, in that it fails in explanation in respect of repulsion.

Still adhering to our contention, that difference of polarity lies in the difference of behaviour of the same

substance, we can now briefly state that a current is the same substance flowing in opposing directions, and the normal direction is decided by the balance of the opposing currents in favour thereof.

This is nothing more extraordinary, than that a current consists of the two different polar forms of electricity moving in reversed directions; which clearly must be the case in electrolytic conduction, in spite of the fact that difference of polarity by contact produces neutralization, which would mean nothing is moving. But the theory of intersistence allows one unit ostensibly to pass through another unit, in that the space occupied by any unit is not persistently so occupied, but only momentarily. Modern Physics has on the other hand its discrete units persisting in space, hence no molecule or corpuscle can pass through the space occupied by another molecule or corpuscle at the same time.

We are able to explain how anything manifestedly can pass through another thing without displacement of position; and therefore there is really nothing extraordinary in our assuming, that a current is or can be a substance flowing in a conductor in the reversed directions at the same time.

Physicists have neglected the fact, that when an electrified conductor is earthed, there is contact and the development of electricity by contact is not only a known fact, but is the basis of frictional electricity production. Therefore the momentarily flow of electricity from a charged conductor, when earthed, is no longer a matter of potentialism deciding the direction from plus to zero or zero to minus, but it is a case of developing fresh electricity by earthing: that is by contact.

Thus in electrification by friction we are virtually in this way producing in one body a true state of electrification, and in the other body a state of de-electrification.

It is not necessary here to take into account the production of electricity by deflection of gravity, for we are merely dealing with electricity as the same substance

whether obtained by mere contact or from a galvanic cell or by magnetically induced currents. Though in induction this will be necessary. This subject is however, reserved for a subsequent chapter. So we can proceed with the explanation of electro-static effects.

If we play about with electrified bodies, it soon becomes evident the polarity idea of electricity is not so simple as it seems. Franklin's experiment with a Leyden jar, where it was found that if the charged outer and inner conductors were removed under insulation and then placed in contact, on re-insertion in the jar, they again shewed electrification, is peculiar. Unfortunately it is not stated, whether they were in a state of electrification when taken out; it can only be presumed that that they were so to a certain extent in that they were placed in contact with each other with a view apparently to neutralize the two opposite charges. These conditions only held good when glass was the dielectric of that accumulator. When paraffin was used, the charges lay in the inner and outer conductors whether removed or not. The effect with glass is attributed to surface moisture acting on each side of the dielectric as a conductor; for when this was removed, glass behaved as paraffin. But there is no explanation as to why, when the conductors are separated, the charge, usually portable, selected the moisture film. A Leyden jar filled with water, duly charged, could issue that water free of charge, on being poured out.

But against this moisture film explanation, we have the effect of residual charges of discharged accumulators. Here the surfaces, inner and outer, of the dielectric after discharge shewed no electrification, but in time developed a residual charge. There is apparently correlation between the seeming spontaneously developed electrification with the nature of the dielectric and the length of time during which the accumulator had been under charge.

Physicists bring forward the fatigue in elastical effects as an explanation of residual charges. Tapping the systems in both cases precipitates the time taken in

over-coming fatigue and development of residual charges. But such is not in any way an explanation. At the most it is a proof, that what is able to overcome fatigue is able to develop residual charges in accumulators.

Successive alternate charges imparted to an accumulator allow the dielectric to bring out the residual charges in the reverse order. With this flexibility of effects in the above experiments, we are naturally led to believe in electricity of the same kind flowing or radiating simultaneously in both directions, but in unequal quantities. With our deflected gravity units it can be dimly seen, that residual charges are really obtained from this fresh source of energy. For a residual charge can but be a charge additional to the original one, dissipated by neutralization. Such we think can be traced to gravity.

It must be noted here for those readers, who are not aware of it, that to charge the inner conductor of a Leyden jar, the outer, during that time, must be temporarily in connection with the earth. This would in effect amount to charging the outer from a source electrified to that polarity.

Magnetising steel by means of a discharging Leyden charge tends to confirm our idea, that an electric current consists of the same substance moving in opposed directions, but with a difference in quantities; in that the polarities of such a formed magnet vary, although the polarity of the Leyden jar charges remain the same. There are numerous experimental results, which confirm the dual nature of such an electric discharge or current. In fact sparks have been photographed in such a way, that this dual nature is clearly evident. Even spectroscopic examination of the vapour of a spark show, that the elements of either discharging conductors are present: pointing to the current flowing in opposed directions.

But where we differ from the modern acceptance is, that this theory does not recognize action at a distance, and therefore cannot accept two electricities of different polarity; but suggests substitution, by assuming that the

nature of polarity lies in the mutual directions of flow or progress of the same substance.

To say, that the surface of a dielectric such as glass, wax or resin is electrically charged to one or the other polarity is in reality stating, that the electric units, no matter how formed, are radiating outward and innerwards at the same time, and the polarity is determined by the excess in one direction above the other.

If a body radiates out as many units as it receives, on examination that body would shew no electrification. This places electrification on the same basis as radiation of heat. A body may, and we know thermo-dynamically it does contain a substance heat, but it can shew no difference of temperature compared to other bodies close by, which are radiating out as much heat as they are taking in. In this we are in agreement with modern physics as to thermal equilibration.

The velocities of transmission of charges through conductors are so variable, but always of a high order even exceeding the velocity of light in cases. This also tends to shew that the electrical units are intersisting in progression not only in opposite directions but in different courses. For it cannot be assumed, that the phases of intersistence are altered in the electrical units, as long as they behave as electricity normally does. According to our premises alteration of phases of intersistence means a transformation of energy; by which means we can indicate the origin of heating and lighting effects during electrical activity. Therefore we are bound to take it that variable velocities are not really true, but the manifestation of such are due to the variability of space passed through: meaning that the loci of intersistence do not always lie in a straight line, as was considered to be the case with radiations of light and heat.

The most direct evidence of this dual nature of electricity, considered as an in-going and out-going phenomenon of the same substance, is the motion and behaviour of small bodies with larger electrified bodies. A wax electrified candle retains ash on its surface like

bristles, whereas ash on electrified glass has a decidedly more reposing posture. This has not received mention in text-books. In this way, I make out that the so-called positive electricity is a condition of more ingoing units than of outgoing units, and negative electricity is the reverse.

In a galvanic battery it is held that the current passes from the positive electrode to the negative electrode, but in the circuit, outside the battery, of course the direction is reversed. According to our view, it can be said that the positive electrode is the intake of the current in the circuit. Unless the circuit is closed there is no electric current developed in the battery. And as we are dealing with a current of electricity, which can do work, we can be quite clear on the point that the direction is from negative to positive. To confuse the action in the battery with the current outside it, should not be done; in that we know electrification can be produced by two heterogeneous metals in contact. In that case the plane or point of contact corresponds with the battery: Yet the current, produced in a battery of that description, can have its direction reversed by either heating or cooling that battery of contact above or below the temperature of the outside circuit, as in Peltier's Effect.

It would be interesting to know in more detail as to how the electric current in the battery behaves, especially in regard to its magnetic effects. This could be done by making the battery in the form of a spiral tube, thus using the solution as a solenoid for magnetic induction purposes. Ionisation does not appear to deal with this aspect, but assumes the behaviour of electricity in the battery to be in continuation with that in the outside circuit. The way in which we are now viewing electricity allows us to doubt it.

Our task consists of disproving the two views held in respect of the nature of electricity, (Potentialism and Polarity) and introducing our idea, what may be termed Dualism. Potentialism cannot explain electrical repulsion, though it is possible to mechanically understand

attraction. Polarity can only produce an inconsistency: and after all only relies on the assumption that it is the nature for unlike to attract, and like to repel. Yet when we have two wires parallel to each other with a current in each flowing in the same direction, the wires attract each other. Certainly, in this case like attracts like: an inconsistency worthy of note. Again if two bodies are charged positively, it is found that at close quarters they can and do attract each other, whilst at a distance they shew repulsion. If the reader chooses to play with electrified bodies, such as a wax candle and glass; in studying the motions of particles of matter, such as powders, ashes, filings and liquids, a consistent behaviour is not always in force. Glass, our in-taker, sometimes will only shew attraction after contact, whereas wax is ever ready to disturb the particles. And if the experimenter watches the to and fro motion between an electrified body and another body, he or she can believe with me, that there is some substance, that is apparently driving the particles to and fro from the surfaces opposed to each other. And it can be mentioned here, that though an unelectrified candle is attracted by an electrified candle, but if a strip is scratched off the unelectrified candle, even with a conductor, as a knife, the strip always shews repulsion. This does not fit in with the idea of polarity, for there is no reason why the detached strip should be electrified to either sign.

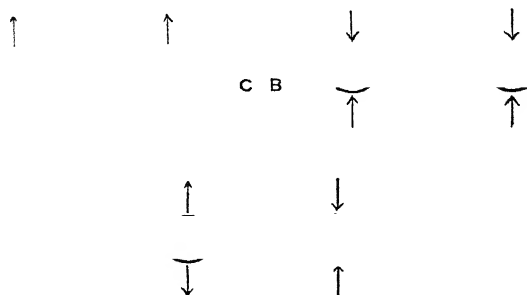
It can now be shewn by the figures on page 167 how we can produce attraction and repulsion with that dualistic electricity previously indicated. But before doing so, it is necessary to draw attention to the nature of adhesion or aggregation of solid particles.

Every dense system has a gravitational field; and in this theory it can be accepted that every dense system absorbs gravity units. This is in accordance with the Design. Now, with a large system as with the earth, the lines of gravity progression radiate out from the centre not to an infinite distance, but to a distance proportional to the volume of the dense system. In this way we are

allowed to assume, that the higher we go above the surface of the earth, the less regular will be these radiating lines of gravity. No body has measured gravity in mid-air, all measurements made are near the dense part of the earth, its mountains or valleys. People flying up side down in aeroplanes only realize such after some time; (we are not dealing with looping) pointing rather to the fact adumbrated, that gravity away from a dense system is probably not regular in its lines of progression. If we now bring these conditions to the atmosphere surrounding smaller and thus tangible dense systems, it can be understood that the gravity units at grazing distance would progress in lines approximately normal to the surface: that is, in direction towards the centre of gravity.

This grazing gravity is the force of adhesion and can account for particles, like dust, even adhering to the under surface of bodies. Consequently when we see ash standing out from a candle (electrified) like a bristle, grazing gravity glues the pedestal, and the radiating-outward electric units give the ash the erect posture. With glass as stated before, the posture is recumbent to a great extent.

We can now proceed to shew graphically the true nature of electrical attraction and repulsion in these three figures:



The bodies electrified in the above three figures are shewn by the plus and minus signs. The arrows denote the

direction of progression of the electrical units, that is the excess of the directions of the units considered as outgoing and ingoing.

The first figure clearly shews, that two positive spheres would shew repulsion, in that the density of the medium at A, would be greater than at B or C.

The second figure shews, that the medium at A to be of a lesser density than at B and C; hence as each sphere is absorbing, each will necessarily suck towards the denser medium: they therefore shew repulsion.

In the third figure the first sphere having a propelling nature, naturally as A is less dense than B, it will push itself towards the other sphere. This second sphere having a sucking nature necessarily must suck to the denser medium A, than towards C: the combined effect is mutual attraction.

Yet all the time that such attractions and repulsions are taking place, it must clearly be understood, that the space at A, in all three cases, has units of electricity, as it were, flying to and fro; but as the quantities of each sphere vary, the general direction is determined by the balance in excess. Whether we can have a case of electric units flowing only in one direction cannot be decided at this stage. Of course the higher the potential, the less units will be passing in the direction opposed to the current manifested.

We certainly by these means overcome the incongruousness of having to consider a body of minus potentiality as possessing electricity below zero: Whatever this may mean. If the hydrostatical view is taken, then certainly the water flowing downwards can be viewed as electricity in motion, but the water at the lower level is neither electricity nor need it be taken into account. Taking a negative electrified body as being of a lower potential, we are faced with the difficulty of dealing with it as no electricity. With our dual system of electricity we endow every electrified body, no matter what sign,

with electricity. In the one case passing out, and in the other case passing in. All we have now to do is to regulate this double stream.

Any condenser charged will retain its charge longer, the better the insulation, and hence keeps its charge for a considerable time in vacuum. In dry weather, here in India, a large hollow glass bead was kept in position of attraction on a wax candle, for a considerable time (about 2 minutes) although ash close to it had dropped off. The glass bead had not been previously electrified; and according to the polarity idea the bead in contact would have received a similar charge from the candle and therefore should have dropped owing to neutralization.

Again the varied directions the particles of ash leave an electrified candle by propulsion, and the almost instantaneity with which ash adhering to the body, that may be considered under induction, shews signs of loss of electrical effect, go to shew, that the action under those circumstances is by no means so simple as is made out to be in text books. In fact such books do not account for moving electrified bodies at all.

Some of if not all the heat produced by a current in a circuit wire, this theory can account for by deflection of gravity; and we can venture to predict, that the weight of any body would diminish under a series of wires, placed as close as possible to each other, during the time a current is flowing through them.

Unfortunately we are not in a position to see how an electric unit can be converted into an active gravity unit, partly in that it is extremely difficult to ascertain the variability of the force of gravity. In the absence of any positive proof in that direction, we are allowed to dissipate our electric, thermal and light units and thus can in this way account for the absorption of electricity, as can be done with heat and light. Doubly polarized light as far as we know is lost; that is there are no means known as yet, whereby we can reconvert light after it has received double polarization.

To deflect gravity into electric units is possible, even if we only use electric units for this effect. If two electric units interexist reciprocally the space or locus of this reciprocal interexistence cannot be occupied by any gravity or other unit during reciprocal interexistence. In this way we have seen above how to account for deflecting gravity into heat; if this is possible then two electric units interexisting will in that way be the means of producing a fresh unit of electricity from gravity. If now we assume for convenience, (though it possibly will be true), that an electric unit can be converted into a gravity unit, we have by this reconversion a means of regulating the flow of electricity between two electrified poles. Thus, if a unit of electricity radiates out from an electrified body about to be brought under induction, if this electric unit interexists reciprocally with any thermal unit, for instance, during that time a gravity unit may be deflected as an electric unit, which then radiates out towards the electrified body. This is noticed in the immediate return of the particle to the electrified body. This is probably seen, to be the case in that induction can only sometimes be produced by electrified glass, after momentary contact with the body to receive induction. And there is no doubt that on starting this electrostatical experiment, there at first appears inertness; once in swing a general electrification becomes evident. Indeed all objects in the vicinity appear to be electrified, and it becomes impossible to follow out the sequence of events from a polarity point of view.

Admittedly, the flows have not been regulated by this presumption, but obviously this cannot be done by simple table experiments. All we can point to is a turbulence, and a means of absorbing and producing active electrical units; and further that the polarity nature of the action can only be entertained, if the multitudinous discrepancies or irregularity are left out of count. To do the latter, which physicists, judging from their text books, have done is nothing else but courting disaster.

The conditions in a battery or galvanic cell are that in place of dielectrics in contact, we have conductors in contact; and the interference producing deflection of gravity into electricity is kept up by chemical action, which is disintegration and integration of the architectures of the cell elements. The conductivity of these elements is essential for producing current.

This theory does not recognize a chemical energy lying in or between the molecules of a substance, any more than the energy supposed to be locked up in the atomic constitution chemical action is in reality a rearrangement of co-ordination of intersisting units; and just as we can disintegrate a solid into finer parts by interference of intersistence of the units of that dense system, we can disintegrate by means of any other units. Chemical combination is a matter of packing the units together, and the way they pack together is governed by the opportunity of packing. In this subject, as has been shewn in a previous chapter, posture and the phases of spatial and temporal intersistence will govern the situation. No doubt, this will require an immense amount of thinking and working out, but it will repay us, in that we thereby adhere to the fundamentals of this theory in a consistent way.

This theory can allow electric units to enter a dielectric, provided the numbers going in reversed directions are balanced. Thus, when we use pure water, a dielectric, as the liquid in a galvanic cell, no matter what electrification is set up at the electrodes, the electric units that pass through the water are equal in number that repass back, under those condition no current is said to pass. In that case any electric unit produced at either electrode, either becomes a thermal unit or by reciprocal intersistence deflects gravity into heat. The electric current produced by chemical action is entirely dependent on the flow direction and magnitude of the deflected gravity. The heat of the battery during establishment of current is reduced, which is due to a lessened reciprocal

intersistence of the electrical units, and therefore a reduced gravity deflection into thermal units follows.

It is impossible at this age of the theory to indicate, as to what regulates the deflection of gravity into thermal or electric units. It must suffice to state that this transformation of gravity is so; and we have seen how it is possible; and more, we see how it can be continually taking place, in that all experiments are conducted in a gravitational field.

As it has been incumbent on us to shew how the motion of a dense system is effected by, what has been termed, electrostatic attraction and repulsion, which has been done on a previous page of this chapter by means of diagrams, it is now necessary that the attraction and repulsion of wires bearing longitudinal currents receive explanation on similar lines.

It was seen from table electrostatic experiments, that the dual nature of electricity, wherever it resided, could impel, (not allure), particles to and fro; and that the attachment of any particle, which seemingly from its erect position was being impelled away, was due to the grazing gravity units entering the electrified system. We, from such, felt quite convinced, that if movement of bodies was produced in this way, that is by interference of intersistence, the units producing these movements were intersisting progressively along definite lines. This shewed, that the supposed statical arrangement, derived from the view that polarism in its nature was action-at-a distance, was far from correct; and that though the surface of the electrified body initially was the centre of the deflection of gravity into electric units, as soon as these units appeared, the atmosphere or space adjoining the electrified body behaved as a turbulent plenum. And this turbulence disappeared in time apparently by dissipation or re-absorption of the units engaged in it. Much like an original shock to an ant-hill or hole would bring out an ever increasing number of ants, but in the absence of further disturbance of the hole, these ants would spread,

and some or many would re-enter the hole, leading to quiescence: with us this is electrical equilibrium.

If, now, we take two wires with currents in opposed directions, we would also find the atmospheres surrounding each in a state of turbulence. But whereas the wires being conductors, the electric units intersisting progressively therein can be assumed to follow the course of the wire, but not so with the dielectrics surrounding the wires, these would be in a state of turbulence.

By turbulence, it is not meant that the units intersist chaotically, but that their lines of intersistence are not confluent with the lines in the wires.

Now in each wire, we have a definite number of units intersisting progressively in one direction and a definite number in the opposite direction. These conditions enabled us to deflect gravity and produce the current. Now if we bring such conditions of reversed action in the atmosphere between two wires with opposed currents, the greater interference of the units in that space would tend, as it were, to expand the dielectric; much as has been shewn in the chapter on Pressure and Gravity, where pressure of a gas would increase with an increased gravity force. It is therefore conceivable, that the dielectric in nature between those wires would allow of the units radiating outwards, thus forcing the wires apart. If the two currents flow in parallel directions under such conditions, we could expect the intervening atmosphere to act not as a radiator, but as an absorber. We always have the grazing gravity pushing normally to the surface of any body at all times, if this is taken away from one side, say of the four sides of a cube, the cube would move in that direction towards that side. Whether these are the conditions of attraction between two parallel currents flowing in the same direction, cannot be laid down conclusively in the absence of gravitational experiments, but the principle in producing this attraction and repulsion is conceivable, hence plausible.

It must be borne in mind that reciprocal intersistence of any units, a powerful deflector of gravity or even any

other form of energy, is strictly speaking only possible if the two reciprocating units intersist progressively in opposite directions, and thereby it follows that opposing currents can deflect more gravity units between them, than confluent currents. Therefore generally, I think the reader will admit these explanations of attraction and repulsion, in the absence of postulating action at a distance with the hypothetical nature of polarity, are sound. In any case no explanation of these effects can be attained by adhering to the the potential view of Electricity.

We feel quite certain, that such motion originates in the same way as any other motion, and though we admittedly have not the details of the mechanism clearly before us, we have the principles under which motion is produced laid down in unmistakable terms. And we can satisfy ourselves, that the attraction of two conductors with currents can only be detected at close distances. And further knowing that dialetrics under those conditions are under strain, there is every reason to believe a force is in action. Hence, if Physics can view pressure, therefore strain, as molecular bombardments; we, attributing such motion to the interference of units intersisting in spatial phases, can view strain in a dialectric as being produced by electrical units producing interference in the dense dialectric system, much in the same way as gravity produces pressure; excepting that the electrical units intersist in lines of progression in reversed directions.

Chapter XV.

Magnetism.

The fact that a magnet can be broken and still retain its difference of polarity leads us to believe, that as such is not the case with electrified dielectrics the conditions exhibiting polarity must be different. Thus, a magnet in this respect resembles an open tube full of water, and an electrified body behaves more as if the tube were blocked in the centre. The open tube, no matter where broken, would always contain water, which could shew a flow at either end; whereas the blocked tube could be made to break, so that the fluid only in one end was retained, and therefore could not flow in both directions. The illustration, however, must not be taken literally.

The modern idea of what magnetism really is is vague. Nothing is gained in this direction by merely supposing a steel magnet to be composed of numerous molecular magnets; even although certain magnetic phenomena can be explained by assuming the magnetic molecules in the solid magnet have mobility of the rotational type. The question is not answered thereby; and is still put, in that it is essential to know what constitutes molecular magnetism.

As with electricity we were concerned in explaining away action-at-a-distance. Even Physics must admit, that motion of any substance, which necessarily occupies space, occasioned by electrification and magnetisation must also be accounted for; even if their basic principle of action-at-a-distance is adhered to. If we see that interference of intersistence in one position is motion, then wherever the manifestation of motion occurs it must be accounted for in like manner. To be consistent, we try for nothing else; in that we believe the nature of things is likewise consistent. Physics at present can see motion produced by impact, and motion produced by a beckoning

force, but they admit the motion produced either way is the same: That is, there is motion of a stone pulled by an elastic substance, as there is motion produced by gravity, electricity and magnetism. The only distinctions in motions are the that in one case the motion can be steady and uniform and in others cases variable and accelerated. But either simply means alteration in position in space.

One important fact is that electricity and magnetism are more closely associated with each other than any of the other forms of energy. Hence the electro-magnetic idea of the nature of all things, in which the basic principle is that a moving electric charge is accompanied by a magnetic field. But the point still stands clearly out, that magnetism is not electricity; and we are bound to believe on the strength of modern physics, that the disappearance of one means the appearance of the other. This is not actually consistent with the idea of electro-magnetism, which roughly states, that the appearance of one entails the appearance of the other. If a bar of iron is magnetised by an electric coil with current, apparently a certain amount of electricity apparently must disappear to appear as a definite amount of magnetism on the basis of conservation of energy: and further to keep this magnetic field permanent, it is quite clear a current of electricity must be continually in action. If so then there must be a continual dissipation of magnetic energy in correspondence with the electricity supplied. In this case the magnetic energy can only be produced to a definite amount guided by the consumption of electricity; and we can repeat that the magnetic energy in quantity must be wasted as fast as it is produced. But what we do not learn is, as to its nature during dissipation; nor does the electric coil appear to be doing any work under those conditions.

It would be interesting to watch the curves in magnetising an iron bar and an unmagnetised steel bar with the aid of an electric current. Unfortunately I can

find no reference to this matter. It would also be interesting to know, what becomes of the electrical energy ostensibly flowing in a closed circuit and generating battery. The mere statement, that such is dissipated into heat is not sufficient for our purposes, and does not satisfy the appetite of Reality.

When, however, we come to deal with a permanent magnet, behaving in all details the same as an electro-magnet, we are bound to say that a certain amount of energy resides in this permanent magnet; and the strange part is, that the magnetisation is fairly constant apart from its other strange behaviours: To which we will allude to later on.

Physicists judge energy existent in any body by the available force which can accomplish certain work. The point now is, as to how this constant magnetisation is being kept up to standard by the consumption of some other energy, as was apparently the case with the electro-magnet. If we were dealing with heat, it could be said, that as heat radiates into space from matter, the body keeps to a normal temperature, in that the loss by radiation is supplied by heat from extraneous sources. Hence, generally a body at rest is constantly receiving and dissipating the energies it possesses. (How inconsistent this is with the kinetic energy of a moving body which gains and loses none for all time; but we will leave this matter, incidently mentioned, for future treatment). On this a permanent magnet is likewise receiving energy and dissipating the same; like a cistern receiving water with an over flowing pipe. And this is in consonance with the idea, that an electromagnet is continuously being supplied with energy by the electric current. For if not, then by shutting off the current the bar of iron should remain magnetised, which is not the case. If magnetism is energy, where does it in that case fly to.

The same applies to induced electrostatical charges: the induced charge disappears with the inductor.

Our theory provides for the magnetic energy, of what may be termed, the permanent magnet, in that we can draw upon deflected gravity energy continuously, without disturbing in a sensible degree the gravitational field. We can, therefore, legitimately though tentatively suppose, that the electric coil supplied with a current interferes ; hence deflects gravity in the iron core inserted therein.

If we study the interference of heat with magnetisation, we learn that at a critical temperature, not only are the magnetic properties of a magnet lost, but iron or steel at that temperature refuses to be attracted by another magnet. Therefore, if such effects are taken into connection with the variability of specific heat of iron at that temperature, only one conclusion can be reached, and that is the architecture of iron and steel has much to do with magnetism. And more evidence forces us to that conclusion, in that a weakly magnetised bar has its magnetisation increased by temperature ; whereas the opposite effect is noted with highly magnetised magnets. This certainly does not point to heat being converted into magnetism, and we are nearer the correct solution, if we attribute magnetisation, as we did electrification, to deflection of gravity.

Again the relationship of strain to magnetisation shews a wonderful reciprocity, in that weak magnetisation lengthens a bar, and lengthening a weak magnet causes an increase. With a strong magnet we get the reversed effects. But more strange is it, that a wire magnetised twists, when a current is passed through it.

This all reminds one of the reciprocity of piezo-electrical and pyro-electrical effects, where pressure produces the same signs of electrification, as that produced by cooling ; and tension, the reverse in effect, is the same as in heating. Here physicists see, that the architecture of the body is closely associated with these changes in energy ; but they do not see with us, that change of architecture entails a momentary deflection of gravity,

and that pressure cannot really be converted into heat, though its effect may suggest such in that example.

We, from these accounts, are led to believe there are units of magnetism as there are units of electricity, heat and light; but it cannot be said definitely, that it is possible to see that magnetism and electricity differ very much in nature. If a magnet touches another piece of iron, and we compare the effects with wires conducting electricity, we certainly realize that the peculiar properties in each case are transferable. But the effects of induced magnetism and induced electricity are different, in that an induced electric current is only produced, if the intensity of the inducing current is variable, whereas with magnetism and electro-statical electricity the induction is permanent under the influence of a permanent inducing body.

This latter fact, of course, suggests, that a magnet has magnetism, in that one pole is radiating out units and the other is absorbing them. If this view is adopted, naturally as we can explain electrostatic attraction and repulsion on the principle of absorption and radiation, (as has been done in the chapter on electricity), the same can be done with magnetic poles: that is, if we view each magnet pole as an electrostatic sign. The only difference in magnetism is, that we have the moving substance or units acting in couples and not acting direct as in electrostatic movements.

The fact that a gas, like oxygen, can shew fairly strong magnetism not only supports this idea of magnetism, but rather precludes us entertaining the magneton idea, in that the kinetic molecular theory does not allow of the orientation of these magnetons being permanent. The dia-magnetism of Bismuth and other bodies in physics is really treated as a negative force, whatever this may mean; with us, judging from its behaviour in a magnetic field, it is more likely to be a substance, like radium, radiating out energy, derived from deflected gravity.

Chapter XVI.

Induction.

In the earlier part of the book we were able to overcome the enigma of Gravity; and what was viewed as a force, as the inherent nature of matter, became energy or substance occupying space. On the same lines we are now called upon to explain the nature of electrical and magnetic induction.

By induction, it is meant that a similar property, electrical or magnetic, can appear in another body, without apparently any transference taking place from another body, known as the Inductor. Generally the idea conveyed in Induction is, that it is not a process absorbing time, but a state of instantaneity.

If the earth moves towards the falling stone, it can be said that motion in both bodies appears instantaneously. No energy is absorbed, for it is the nature of matter. Nor can it be said, that the cause of that effect lies particularly in one and not the other body. Viewed in whatever way it may be, the action is instantaneous; that is both the stone and the earth start moving at precisely the same moment.

When such is compared with all known dynamical processes, we see a difference which has never been appreciated in correspondence with its importance. The Cause, Action and Effect of empirical dynamics disappears on the introduction of action at a distance. In the latter case the cause is vague, and the action is absent; and thus we got that effect of motion in a gravitational field remaining for so long enigmatical.

And so with Induction, viewed under the prevailing ideas of Physics this action-at-a-distance is also an enigma.

Fortified with our conception of energy, as substance occupying space, the appearance of energy in any body

under induction can be intelligibly explained. And now that we know all experiments necessarily must take place in a gravitational field, we can abstract energy therefrom without having to invoke the aid of Action-at-a-distance: a hypothetical monstrosity, we have been contending against for so long.

By denying that the earth moves towards the falling stone, (for such has not even been indirectly proved), the seemingly instantaneous action of the force of attraction resolved itself into the conjecture, that the stone, prior to falling, lay in a moving fluid; and that, therefore the moment it was released from a state of rest it acquired its motion from that of the fluid. Though induction may seem to require a different treatment, the explanation comes to the same thing, in that it is the intention to shew, that the inducing influences are present in space; and by bringing a body into that particular space the phenomenon of induction becomes existent. As modern physics puts it, the lines of force are there; hence induction is possible.

With radiations, as in the case of light, the luminosity of one body as produced by another is not in essence a case of induction; in that we know light occupies space and has a velocity. But as far as our powers of preception go, it could be said a body shews luminosity because it is in a luminous field; just as mass can shew motion and does shew force because it lies in a gravitational field; or for that matter in an electrical or magnetic field.

The whole thing resolves itself into arriving at a decision, as to whether there is really a difference between an electrical or magnetical field and a luminous field. This theory says there is none; and therefore induction without a period of action is impossible. That is induction as we know it is not really governed by Instantaneity.

These fields of force must be swept away, for neither the broom made out of tubes of energy, nor the cloth woven with modifications of aether are able to do it; but we can succeed, if it is borne in mind that cause and effect cannot be instantaneous, and that motion is produc-

ed in one way, and one alone.

If then induction is not governed by Instantaneity, it is not induction in the ordinary scientific sense. There is, therefore, no other alternative but to consider that the appearance of energy in the induced body is undoubtedly derived from an extraneous source. This means movement of something through space, entailing that substance has passed from one thing to the other. As this is energy, which bears quantitative examination, the inductor must loose a certain amount of energy in the process of induction. But experiments in this direction do not always quantitatively confirm that idea in induction. A magnet remains just as powerful lying in the midst of its magnetic field, whether lumps of soft iron are lying in it or not; and take these lumps from out that magnetic field the magnet appears of the same power. Any magnets in action and out of action delivers up its magnets untouched and not necessarily impoverished; and under certain conditions the lifting power of a magnet grows without a seeming absorption of energy.

It is for this reason, that in the last chapter on magnetism, we were able to see that a gravitational field could keep the magnet up to standard. And we can now view a magnet as we did an electrified body, which is that the units of energy are leaving and re-appearing in the system continuously. This is borne out by the fact, that the magnetisation of a magnet never remains really constant. Heat in destroying the architecture of a magnet merely renders it unfit for deflecting gravity.

Thus, if we take contact magnetic induction into account, we can feel quite certain that the kinetic energy absorbed in rubbing a magnet on a bar of steel has nothing to do with the quantity of magnetism apparently produced thereby. A steel bar tapped will develop magnetism; and a magnet tapped will loose some; and more a broken magnet will retain its polarity. Surely all this seems only possible in a plenum from which energy can be derived, which with us is the earth's gravitational field.

No work is apparently done in producing induction, and since no energy is absorbed in correspondence with that induced, we must view induction as a property of a gravitational field. And it must be left for another time or age to shew how the kinetic energy can alter the architecture of a system of units, so that such will by deflection of gravity enable gravity in its transformed form to do all this enormous electrical work of which we are so proud.

If a paddle is whirled in a vessel of water and heat is produced, this theory says that the kinetic energy of the dense units of the paddle are able to disturb the architecture of the water and being in a gravitational field, gravity is deflected and heat is produced. If a conductor is whirled in a magnetic field we have a disturbance of energy units, the architecture of the magnetic field is altered, gravity is deflected and instead of heat units appearing, we see electrical units produced.

Admittedly, for the present, the action cannot be exactly described, in that we have no data as to the amount of gravity absorbed; but the principle is sound and consistent with the theory.

A former illustration can be now put in the form of a question. If the cannon ball fired from a distance displaces the foundation stone of a chimney stack, can it be held that the stack falls through the energy delivered by impact? The answer assuredly will be no. And the only explanation of the fall is, that it has been effected by gravity. Consequently any system in a gravitational field can be disintegrated by the gravity units, if conditions allow of such. So with a weak vibrating tuning fork, considered as such as the point of origin of sound, its power of ever doing increasing work is gathered from the fact, that all the air filled space resounds with sound as the sphere enlarges.

But with such examples we are trespassing on the domain of Cohesion, where elasticity is treated as an effect due to the gravitational field. But it is essential to

establish our view of Induction and we must be pardoned, if unconnected collateral examples are conjured up. For by such means we are able to consider that the Hertzian waves of wireless telegraphy as being really emissions, as we would view the X-rays of radio-activity; * The latter will again call upon an aethereal plenum for transmission, which will restart the same difficulties physics has endured with Light. Waves want dense things with restituting (elastical) forces behind them, which cannot be found so easily; and so far have remained hypothetical. Therefore, how much easier is to believe, that substance intersisting as units in dense loci do produce all these manifestations in a gravitational field. When Mars has sent that message, considered by some to be due, then indeed the corpuscular nature of wireless telegraphy will be accepted and the manifestations of Light and Wireless will be set on a par. The receiver in that case will correspond with the sensitive photographic plate and our eye.

Whether our units reappear in virtually speaking the same loci or in loci 450 feet apart, the fact that intersistance is their nature does not preclude either as absurd. Space in the eyes of the Universe can be of dimensions unacceptable to mankind, yet not recognised as incongruities in the Reality.

Though, correctly speaking, the propagation of these Hertzian waves has never been considered to be a mode of induction, virtually it is; and if viewed in our light, in which induction has been done, bearing in mind such is taking place in a store-house of energy the manifestations of wireless need not remain difficult of interpretation.

This theory therefore views induction much in the same light as physics has dealt with the hypothetical wave motions of the aethereal plenum. Spherical waves radiating out from a point, (the focus of disturbance),

* It always seems anomalous that the radio-active principles should vary in constitution to that extent in recognising the low penetrating alpha and beta rays as emissions, whilst the high penetrating gamma rays are considered to be waves; these being two quite different things.

must diminish in amplitude inversely in proportion to the areas of the ever enlarging spheres. Physics will not allow that the work done in producing any particular wave at any particular moment grows in amount as the waves spread. For it stands to reason the amount of matter, with sound, and the amount of aether, with light, responding in motion to the original foci of disturbances must always be increasing in proportion to the areas of the increasing spheres; hence the amount of motion or amplitude of the wave in propagation must decrease proportionately. One, therefore, wonders how light from distant celestial bodies is able to retain any amplitude of its vibration in proportion to its intensity of luminosity. Possibly for such reasons the wave Theory of Light is being abandoned.

Sound behaves in the same way: in that the amplitude of vibration must decrease inversely proportionate to the area of the enlarging spheres of propagation.

Any wave motion cannot be amenable to Doppler's effect: That is the frequency of vibration of a focus at rest or in motion should remain the same with an immovable plenum: but it does not do so either with light or sound. An approaching whistle is shriller than a receding one; and we are asked to accept, that if the whistle recedes with a velocity equal to that of sound, no whistle will be heard at all.

If now we return to the amplitudes of sound vibrations, we learn, that if the amplitudes and periods of two vibrations be equal, the resultant vibration on superposition will have double the amplitude and strangely four times the energy of either. Where does this extra energy come from?

With us Light is in the nature of a corpuscular emission, which is unable to seriously interfere with gravity as compared to sound, the X-ray waves, Hertzian disturbances and electrical and magnetic inductions. We, therefore, view these latter examples as instances, where the increasing energy is entirely derived from the gravitational field. It is simply a matter of degree of Induction

governed by the spatial phases of intersistence of the particular factors. The distances of the loci for sound disturbance are extremely small, as compared to the distances of the loci of electric or magnetic units, but the principle of action or induction is the same: The disturbance tends to grow by the agency of gravity, which gives elasticity to Cohesion in dense matter, and powers, yet unflamed, to the incoherent units of energy. The principle of resonation in sound and wireless telegraphy are the same. Sound travels against gravity better than with it; and wireless seems, in following the curvature of the earth, to spread normally to the direction of gravity tending to shew some correlation to a gravitational field is in evidence.

To appreciate this construction put on Induction, the reader can view it in the form of an illustration. The word of command issued to a battalion undoubtedly excites the men to become active or cease from activity. A disturbance in a crowd, starting locally, can spread throughout that multitude. Neither the energy of the Commander's voice or the exhibition of force of one member of the crowd is comparable to the resulting energy displayed. And so with induction the disturbance acts catalytically.

Chapter XVII.

Life.

If I catch a falling stone, I feel I have interfered with the natural course of events. If the stone falls to earth, I feel I have not; and the natural course has been taken entirely due to my non-interference. From a physical point of view, there is no difference. If the stone is arrested by my hand in falling or is stopped by the surface of the earth beneath me, either of these are the natural course of events.

This theory to be comprehensive, and therefore true, must be able to explain the nature of Free Will.

That it is something belonging to the Universe, we feel certain, just as it has been recognised that Inertia of mass is the nature of Matter: the latter we have already shewn to be the Insistence of Re-appearance of a unit. We are now confronted with a very delicate matter concerning the Will of living organisms.

What we do know is, that a living organism consists of matter built up into a system, which has a responsive power; and as will be seen latter on, consciousness of this power in action is Will. Judging from the physisiological activities of other living organisms, though we are unable to discern in many a nature of Will, we feel inclined to think that all life must be endowed with a Will. Strictly, and honestly, speaking we do not know where to draw the line. Possibly there is none.

Life, like capillary attraction and interdiffusion of fluids, appears to defeat gravity. Though a living organism, like the seed of tree, is being constantly forced downwards by its weight, under certain conditions it has the power of forcing itself upwards against gravity. The flying exploits of man illustrate this most vividly, and the whole of the Living Kingdom teems with similar examples. Therefore we can safely define Life by this

seeming trait to defeat gravity, and admit that a living system impressed by an extraneous force can in reaction bring forth a greater force: in other words its responsive power is a thing in itself. No wonder than people, from time immemorial, have felt that energy can be spontaneously created, and hence on this the creation of the World-Business should not appear to be such utter nonsense, as scientists hold it to be.

No doubt, Science, on its present basis, is seeing potential energy locked up in its atoms and molecules, and points to its liberation in chemical action; but scientists must be for ever undecided as to the nature of that potential form; simply for the reason that they have given volume and mass to their electric units, and have lately estimated the odd hundred tons of light that fall on the earth with a concomitant loss in tonnage of the Sun: Clearly they must find the space in the atom to locate this energy, which they cannot.

It is one thing to produce or expose energy, but it is quite another matter to expose it, so that it behaves as we want it to. For it is easy to picture heat inside a body, but quite another thing to arrange for its radiation outwards.

We, however, look to the gravitational field, in which the organism exists, as the store-house from which this seemingly spontaneous production of energy is derived.

A lump of iron under compression is only able to shew a reacting force equal to or less than the compressing force, as the compression is stationary or in action. The iron can never shew a greater force in reaction, unless we reverse the process and expand the iron by adding heat. If now we could conceive, (which we really can), that compression could take place without the production of heat, it is possible to look upon the heat, namely that produced under compression, as added heat. This, in that case, would be an additional force called forth by the lump of iron acting, as it were, against the compressive force; in that heat tends to produce expansion. Physicists

see with gases, that the heat so developed is equal to the kinetic energy introduced by compression; but they also know this law does not universally hold good: In fact they have to assume that such only would be so with a perfect gas, which has never been handled. They make a gas perfect to accommodate the law.

Chatelier and Braun enunciated in Physics the principle of mobile equilibrium; which states, that when a factor determining the equilibrium of a system is altered, the system tends to change in such a way, as to oppose and partially annul the alteration in the factor. This statement corresponds somewhat with that of the Responsive Power of Life, and is worth entering in this chapter, since it is a physically accepted principle.

Life, therefore, seems opposed to the fundamental design of this Universe, which is to pack infinite space with infinite substance. And this is in agreement with the falling stone, illustrating that the Will can and does interfere with the natural course of events. Like in the game of chess the Knight is able to defeat the general crushing design of the game, possessing a move directly opposed to concentration. Yet in spite of all this, we feel this theory of the constitution of the Universe cannot be founded on two designs. But on this we have devoted another chapter; for Life appears to be the stumbling block between Science and Philosophy, and only by being able to shew that Life is under the patronage of both, do I think a reconciliation can be effected.

It is quite certain, that if there was only one unit of substance intersisting in infinite space, so far as our consciousness is concerned, we would know of no manifested change in phenomena. We might add, that even if there were infinite units in infinite space, should their intersistence phases be all similar, there could also be no change manifested. To produce a change we must make a change in this world of uniformity. This we know can be attained by addition. Hence, it becomes evident even on this, that the Infinite Space is not infinitely and completely packed, but that units are being continually added or created;

which, through their interference in intersistence, produce in our consciousness all those manifestations we are aware of. And as long as units are being added, we can be sure the design is in operation. Whether in that process room is made to pack into the space so cleared, or whether units are packed into unoccupied space is all the same; the process of packing is in operation.

Is it then possible, that we become conscious of a responsive power or will only during that stage where alterations take place, which in nature could correspond with the making room to pack therein? For in making room clearly we are not strictly packing; but in order to pack we must make room, and thus the architecture is altered to receive additional units.

This may be the case; for if we concern ourselves with the continuous process of sustenance, agreeably as with the human body, we find the Will is apparently not in action throughout. Man voluntarily seeks food and swallows it; but the moment he has committed the act of swallowing, the food passes on through the alimentary system without his recognition. It seems strange that the Will is only active in the first stages to be succeeded by involuntary action, which is again only reversed during the period of defaecation: Would it not be truer to say, that the responsive power is continuously in action and consciousness is suppressed during the involuntary stage?

And so with our thoughts. The will only appears of momentary consequence, most of the thinking a man does, requires no effort and is often long sustained without any apparent volition. A man does a lot of thinking because he must. That a man can vomit or pull up his thoughts, that is interfere with the natural course of events, is brought about by something additional. A suggestion that the food swallowed was not clean can bring a reversal of the involuntary digestive process: anything incongruous in a train of involuntary thoughts immediately arrests the process in a similar way.

Dreams probably bespeak of continued mental activity during sleep. People asleep, shewing every signs of

mental excitement, may wake up and aver to the contrary. Indeed they may feel convinced that they did not dream at all. Surely such is an indication, that the mind is active for all time, and simply being unconscious of its manifestations is no criterion of inertness. Thus can it be said that dreaming is even maintained during the waking state; giving dreaming a meaning, that there is a continuous activity of the mind of which we are not conscious of, even in the waking state. If the eyelids are not opened, we see nothing of that which would have entered the eye without that screening effect. Here can it be said, that we are not conscious of what could be seen; and so with the ideas or pictures of the mind, unless the architecture of the nervous system allows of it, no matter how much mental activity is existent, we know it not.

The point to be reached is, that a state of consciousness is dependent upon the nature of intersistence of the units of the neural architecture. And put more fully, as an illustration, it can be said we only realize the existence of innumerable uniform dots on a piece of paper, if the dots move or re-arrange themselves: That is, we are only conscious of certain phases of intersistence of the units of the nervous system and not of others.

It must be admitted, that a complete explanation of the nature of responsive power, without and with consciousness thereof, cannot be undertaken at this stage of elaboration of the theory, and the reader cannot expect more than suggestions; but these are all based on the assumption that the basic principles of this theory are true.

If we are conscious of a responsive power in our bodies, we are merely stating that our action in that particular case is voluntary. But all responsive power is a part of the Universe, and has no connection with the Consciousness of it. A thousand of things may be happening or innumerable things are existent and could be realized or perceived; but, as a matter of fact, we are not conscious of them, entirely owing to the nature of the intersistence of the units of our nervous system.

In all probability it will be found, that consciousness of the manifestations of the interaction of intersistence of the units of our body is only possible, if the gravity units are deflected abnormally. This is in agreement with our original explanation of the nature of Work-done; where we shewed how a man could do work in pressing down upon a table, though he would be doing none if standing thereon; except of course the work done in balancing himself. Doing Work is a distinct feeling akin to Thinking.

If we took two gases with great differences in density, with our ordinary mechanical conceptions, we would marvel in watching the heavier ascend into the lighter atmosphere and the lighter descending into the denser part: We could call this interdiffusion a responsive power akin to Life. When we watch water rushing up a wick or capillary tube, we naturally want to know why this sudden exhibition of energy takes place, just as much as our desire would be to know the mechanism, that makes man hunt for food, and then swallow it. And again, when we see one liquid sucking up another liquid as in osmotic action, the idea of a responsive power in action is vividly brought before us. The nature of elasticity is an enigma to physicists even to this day; there is something "living" about it: Elasticity lies in the system, and is apparently independent of outside forces. A pendulum may vibrate to and fro, but the action of the restituting force of gravity is evident, with elasticity this is not so. And so with Life, it is not clear from where its force of activity is derived. Had it been so, Science would have dealt with it ere this.

When we examine the anatomy of living organisms and study, as best we can, the physiological functions, we see that Life has seized upon the processes mentioned in the preceding paragraph. No wonder their nature and the nature of Life in general resemble each other so much. And, if we now add the catalytic and isomeric action in chemical transformation, it can be said we know enough of living action, excepting that its source

of energy is doubtful. However the marked elasticity of the tissues in general and in the muscles in particular seem to point to the direction in which we must look.

In the chapter on Cohesion we endeavoured to account for elasticity by the universal presence of gravity units in the gravitational field. This could only be done, if the nature of progression of these units were in nature of intersistence: and we derive support in this contention from the fact that a liquid moving with a great velocity exhibited more rigidity than in its quiescent state. And then in elasticity a force could be seen in a system increasing, as it were, in response to the deflecting force. Some organisms may move by eating their way into the denser parts of the liquid, but to do this the system must create a vacuum, which seemingly must be done by elastic walls. Even in the growth of a tree, with its movement against gravity, it seems impossible to believe the upward rise of sap could reach such great heights by capillarity unaided by elastic walls.* And, even, when the sap has risen by capillary force, a force is required to liberate it for metabolism and transpiration.

If then the physiology of life is mainly constituted of capillary action supported by elasticity, and in other ways relies on osmotic pressure, interdiffusion, and chemical action, and we have shewn that these process are dependent on a gravitational field in which they occur, we have gone a long way in proving Life is derived from Gravity.

But without a suitable architecture the seeming response shewn in living matter, thus acquired by deflection of gravity, would be impossible; and there is much in favour in believing that such deflected gravity lying in living tissues as heat, electricity and other known forms of energy, also exists as "vital units", the phases of intersistence of which will differ correspondingly and necessarily interfere differently. For, if the thermal units can radiate to a conductor, and this conductor can retain sufficient heat to shew that strange accumulation marked by a strong rise in temperature, it can

* I now learn, that Bose has come to this conclusion,

be taken that vital units also could suffer radiation and shew retention in a similar way. And leaving aside, for the present, the question as to how responsive action in life is actually produced, it can at least be seen that a stone wall structure falls to the ground by the force of gravity through the foundation being interfered with; and this can be effected by, a cannon ball reaching that position from a distance. And so with the human architecture, a vital unit can produce interference of the dense units, and behaving like a catalytic agent, Gravity produces the rest. Thus it is with a drop of water introduced into a vessel containing dry hydrogen and chlorine, combination and explosive violence are rendered possible.

By the photo-chemical effect of light, we are able to produce a picture of anything comparatively in accordance with what we see by eye. But it is equally certain, that man can see things, which do not exist: that is, they are not derived from the action of light entering the eye. It can also be said, optical illusions tend to shew, that we can see real things differently' (I think this is conformed by astronomers) to what they should appear to us from optical inferences. And then we have that peculiar power of seeing things and even hearing sounds, where they originate or are reflected; conditions not found in the other senses.

The latter can be explained, in that as our consciousness as previously suggested contains, at it were, the trinity of the Universe, there should be nothing strange in this recognition of an objective world. Though it must be admitted we do not feel the heat *in* the fire, but we do see a light *in* the lamp. This strange difference does not debar our throwing our consciousness as it were, throughout space and into the reality of time. For, if such were not the nature of passive consciousness, to my mind the interaction of space, time and substance could receive no recognition; that is the Universe would not exist as far as I am concerned. The mistake lies in endeavouring to make consciousness an active principle, which virtually

conditions it in space and time, and endows it with substance. But the way we in this theory have viewed consciousness is, that eternity of time, infiniteness of space and intersting substance are three "finite" realities in the ultra-reality: in that we are conscious of the past, which is termed memory and equally conscious of the future, as shewn by prevision, so far as time is concerned: and our knowledge of space contains comprehension of infinite space and no space. Intermixed with these two realities we have substance in volume, as a spatial conception, and persistence, as a temporal form. And just as we have made units in space by volume, we have made units in time by intersistence. For continuous persistence could not divide time any more than an infinite volume could divide space.

Therefore, to resume the subject of perception, we can view the vital unit, at present, more as the catalytic agent producing interference of intersistence in the architecture of our bodies, which allows of still further deflection of the gravity units, producing all those numerous manifestation of perception we know originate in our bodies.

Of course, we are absolutely in the dark with regard to existence of energy in the form of vital units; but the feeling is gradually gaining ground, that the proximity of two similar organisms shews conditions or features, which bespeak of some sort of material connection.*

If wireless telegraphy is possible between certain points on one line only, and the wave propagation nature can be excluded, it stands to reason this theory of intersistence shews how particular units having particular phases can set up disturbance at these numerous points; and, as pointed out in the chapter on Induction, Gravity does the rest. So with vital units, they could behave in the same way; the only point we must emphasize is, that this does not imply that a "thought" can be transferred from one body to another.

* *Note* :—The physiological units of Herbert Spencer are complex molecules, hence there is no correspondence between these and our "vital units".

But we can feel quite confident, that we think entirely owing to deflection of gravity: and this in that particular interference of intersistence of the units of the nervous system, brought about by the deflected gravity, could also be produced by vital units in a nervous system of another person. We have also not bound ourselves in stipulating, that there is only one form of vital unit. There be many varieties dependent on difference in their phases. Therefore, the matter can be put, that the nature of the architecture of that particular part of the nervous system decides with the phase of vital unit what is going to happen. Heat if allowed to enter numerous bodies produces variable effects; rubber contracts, water expands and a piece of tourmaline exhibits electrification; and so can we expect differing results, when vital units enter different brains or are formed therein by transformation of deflected gravity.

If the action of a vital unit is viewed more as a catalytic agent in an architecture, bathed, as it were, in gravity; we will have no disagreeable feelings in accounting for mental activity in ourselves and others, as long as we bear in mind, that the, manifestation of thought in the reality is interference of intersistence in a general way.

We can now picture the brain as the centre of this mental activity far clearer, than it has been hitherto possible to do. So when the relative powers of deflecting gravity have been ascertained for the different tissues or structures of the living body, we will find though the neural matter indicates very little chemical action has taken place, a very large amount of gravity is being constantly deflected, which will account for an energetic brain that pulsates in an unaccountable way. Modern Physics can only derive this energetic behaviour from atomic or molecular potential energy, for they have very little chemical change* in the nervous tissue to which such can be attributed. We not only can account for a brain possessing kinetic energy, but we shew properly where our thoughts originate, which have

* Herbert Spencer founds nervous impulses on the propagation of isomeric changes.

always been considered to originate in the brain. Thus can we say, where there is no Brain, there is no Thought.

Though the architecture may determine the nature of the catalytic action, the vital unit determines its inception, and consciousness of such may or may not be attained. Just as it is admitted every part of a picture enters the eye, to a certain degree the person is not truly conscious of all these parts at one particular moment; nor can that person be conscious of every thought in his mind, in like manner. And there may be parts of that picture, which have never been noticed; as we undoubtedly are unconscious of many thoughts: The use of note books certifies to this. This means that Consciousness cannot be identified with any mental activity; yet we know, almost for a fact, that though at the time certain things were not recognised, they must have been impressed on consciousness, since it was possible to recall them later on. It is not Memory, which name is more wisely reserved for recollection of past consciousness. To remember I have seen a certain thing is decidedly different to feeling I must have seen that particular thing. To be clear on this, we are safer in adhering to our passiveness of Consciousness, and not deceive ourselves into believing that Consciousness is capable of Memory, thereby bringing it into the Universe of Space, Time and Substance.

If certain units of light can produce a conscious perception through the eye, we are bound to correlate this action with seeing things definitely in dreams, awake or asleep, which never existed. In the latter instance we do not blame the eye. If so, then clearly there must be other units, than light units, which can produce the hallucination. The same remarks apply to sound, but with smell and taste it is not easy, or even safe, to decide whether a person suffers from hallucinations on these senses; for we have no means of proving, whether other causes are or are not producing these sensations in actuality. In fact, as with the perception of heat or cold, the location of the sources outside the sensory organs is decidedly different to our location of sound and light away

from us; and as mentioned before, we feel the heat and cold at us, and not away from us; yet we know the source may be at a considerable distance away. The sensation of Touch necessarily would not be removed,* but inter-corporeal contact sensations indicate in the other direction.

Thus it appears that with Sight and Sound the processes of interference of intersistence must be different to those connected with the other senses. Judging from dreams, or the memory thereof, a difference is indicated, in that they seldom if ever are devoted to the sensations, other than of light and sound. The reader will probably refer to his or her experiences, which I am not capable of knowing. So far as I am subjected to dreams, even although I may have dreamt shaking hands or receiving something in my hand the actual sensation of touch has never been experienced. Even when we crash down through space, the ensuing bump is never felt as it should be, or even is felt at all. Fever dreams, where one expands filling the room, never bring on the idea that the walls are rigid. In all my dreams I can never remember having a distinct feeling of cold or heat, as I see or hear things. Smell and taste sensations in a dream, if they do exist, we either at the time see smoke or something that savours.

There may be people, who have distinctly experienced these sensations in a dream; and it will probably be found, that they, when awake, can cast these feelings further away from themselves and nearer to the exciting sources, than I can.

The foregoing facts suggest, that in seeing and hearing vital units of some sort emanate out from us in the direction of the source of the sensation: that is, the units interist backwards in progression, much as light can be reflected back to its point of origin. This allows us of being conscious, as it were, of the object in itself. In this way can many acts of suggestion be explained.

Surely a man in solitude is conscious of a different

* Note: —The sense of touch is at the end of a stick in poking.

feeling, than when a hundred people are gazing at him. This change I would attribute to vital units of each gazing person appearing in the person gazed upon, and setting up that interference which is manifested as a strange or nervous feeling. Let the hundred people be changed into fellow workmen, practically in ignorance of each others presence, the nervous feeling disappears.

If nothing left the eyes or heads of people in conversation, for what reason do we then search a man's gaze in that quarter? Unless through effort, no one watches the mouth in action of a speaker; yet the mouth does the speaking and communicates the thoughts.

Whatever may be the source of sound sensation; we know that we hear an echo at the point of reflection of sound. And so with an image reflected from a looking glass; both are perceived in positions differing from their actual sources, but in both cases they lie away from us.

This is the reason or the explanation of obvious facts derived from adhering to the basic principles of this theory. It is useless denying eroticism in Love; just as it is foolish making out that the suggestion of thought is possible without some sort of material connection. But when Spirits are dealt with, as this theory only recognizes in the ultra-reality a passive consciousness, we are unable to gratify spiritualists in their communications with the dead. Much as we feel that absolute death is impossible, we must refuse to import space, time and substance as we are conscious of these, into the ultra-reality of consciousness. If we kept these spirits of living organisms in the Universe, they would require substance to entitle them to reside therein: If we kept them in the ultra-reality spiritual communications denoting activity would be incongruous in the absence of those three Realities.

The great division between Mind and Matter by this can be considered as entirely removed, just as this theory has logically discovered that Energy and Matter after all are but one and the same thing. We, in the search for the Reality must get rid of all these contrasts, and place Consciousness of Mental Activity on the same plane as

Consciousness of the Material World. But this, be it noted, does not entail Thought as identifiable with Matter or even Energy: far from it."

The light units, progressing intersistently, in interfering with the intersistence of the dense units, say, of our nervous system allow of impress of Consciousness, and thus produce a state of perception. Here the actual appearance of light units in our nervous system is not conscious perception; that is Light, a form of energy as intersisting units, is not Perception of Light, but the interference resulting from their appearance in our nervous system is the reality of our manifested power of perception. Nor is it necessary to qualify this state of interference, but it is well to bear in mind, as adumbrated in the early part of this chapter, that the secret of mental or even vital activity lies in the fact that the gravity units of the gravitational field, in which life prevails, are being deflected indirectly through light and possibly transformed into vital units; which by their intersistence and interference allow of Consciousness being impressed.

The idea then is, that mental activity, wherever the architecture and the conditions of intersistence are favorable, is produced by the appearance of vital units in the nervous systems of living bodies. Direct consciousness is only possible by the interference set up by them. Were this not so, though we could live, we would be incapable of thought: and more, perception as a state of consciousness would be possible without intelligence.

This brings all mental activity to a physical basis, leaving Consciousness in the ultra-reality as something that can be impressed. That this is so, can be possibly realized in that mentality reflected, as it were, can and does affect the health of human beings. Many of the enormous number of ailments, man is prone to suffer, can be traced back to a conflict in mentality. For it appears that human beings have three directors of vitality in Reason, Ethics and Instinct, and with the conflicting decisions of these three, such has made man so easily upset in matters of health and in such diverse ways.

Living organisms with only the responsive power of Instinct suffer far less, they live or die, but never sicken in multitudinous ways. Animals, which shew only a certain amount of logical action or intelligence, suffer far less than those domesticated varieties, which evince the additional taste of morality. And finally man, who can hardly act any more instinctly, must refer all his voluntary actions to a code of Reason or Morality. No wonder then that this conflict; which practically is repression of Instinct, has interfered with his vitality. And though a digression it is worth bearing in mind, that perverted sexual instincts are productive of increased intelligence and a sensitiveness in morality, which can be unprecedented.

To merely state that light enters the eye, hence vision is possible, is not enough. Nor is it enough to state that we think unconsciously and introduce therefor the idea that a Sub-consciousness is a thing of reality. It is the mechanism of thought, so long deferred, which is required to shew us the reality of all manifested mentality of every mind in the Universe; and by keeping Consciousness passive but impressionable in the ultra-reality, it has been possible to do so with deflected gravity's aid.

The mother, with a child in her womb, is in a position to be conscious of what, apparently, the child could be conscious of. Though the foetus may not breathe, it is alive and can move, which permature birth proves to be so. To say, that this organism in the womb has no mentality, is unreasonable. Indeed it is far more reasonable to view the fertilized ovum as a separate living organism, just as we view the egg of a fowl as a living thing considered without activity. For who can draw the line where life begins in any egg be it born from a moth or a crocodile? And if no division in this respect can be made, it is useless denying a state of mutual consciousness as existing between mother and the child.

The point now is as to whether this mutual consciousness is impossible on delivery. Judging from actions

of the mother and child after delivery it can be said, that though disunited they reunite during the act of sustenance of the child. With the marsupalia the period of material disconnection is short and the offspring continues living in the pouch of the mother. Biologists naturally consider, that disunited nervous tissues entail separated nervous functions, and therefore separated mentality. But though they may contend that this must be so, they are belated in their explanation of mentality on that basis.

If we adopt the previous explanation of conscious perception of light and sound at their respective points of origin, it is possible to believe consciousness can be impressed by the interference produced by vital units in any position in space, but preferably in an architecture composed of dense units as part of a living organism. This is in agreement with our tactile sensation as well as with the common localization of pain. Now, we know for a fact that we are never conscious of all we could perceive. The belief is forced on us, that the conditions of intersistent interference and the nature of the architecture limit the scope of consciousness being impressed. Therefore on this, we can assume that the mentality of outside systems could impress our own consciousness.

That this is probably the case with the mother and child can be agreeably believed to be so ; and it certainly is not incongruous to this theory to believe the same can happen even after the mother and child are disunited ; since we, so far, are quite clear as to our mechanism of mentality. We must not however err in thinking, we are conscious of every manifestation of this Universe ; for we are conscious of very little, and unless our powers of perception are extended our knowledge must for ever be curtailed so far as direct observation is concerned. Electrical activity is not felt, but we infer it could be felt had we the sense to feel it.

Telepathy has thus our sanction, in that we have shewn how it is possible to be conscious of manifestations due to interference of units intersisting away from us. But as Thought is not substance, the so-called transference

of thought cannot be supported.

The matter can be summed up in broadly stating, that consciousness is directly determined by the inter-sistence of the vital units under conditions we have still to arrive at in particular. And it can be added, that this theory allows of the world going merrily along without a stoppage or total annihilation, which Idealism insists upon would be the case when any one and every one dies. There is not the faintest chance that those "Spirits" will interfere with this Universe. Either our consciousness, whatever this may be in the ultra-reality, is impressed or is not. If it is not, there is no warrant to say it could not be impressed, nor is there anything to shew that what can impress it must have suffered extinction because it did not.

If this interpretation in essence has been laid down on correct lines, a clear solution of the conditions possible for impress on consciousness will undoubtedly be arrived in time; and though this theory may have reached the reality underlying the manifestations of this Universe, it is not necessary to go beyond this to understand the nature of that, which can be impressed thereby producing consciousness in diverse beings. It is true we have dealt with consciousness as something constituting the ultra-reality, thereby, as it were, finiting the infinite Universe; but that has been necessary in that we cannot get away from the fact that we are distinctly conscious of infinite things, like Space, Time, Substance and a host of other things, which have been termed Abstractions. That there may appear confusion to the reader, I fully recognize; and on this issue the theory might be condemned; but it can only be condemned because we are not in the position to create the Universe ourselves and thus keep Individuality and Free-will outside it, taking away all reality and converting the whole business into Idealism. This we know is not the reasonable and it can be ruled out forthwith.*

If we return to more tangible points, the reader may

* Note:—Discussion on the Ultra-reality and Ego will be found in the Appendix,

be able to join issue with me once more.

We, that is mankind, say, that Life viewed in a living organism is a striving to keep alive. Endowed with some form of responsive power the Living Being eats to live, and with the ingrafted power of fecundicity strives in the procreation of its kind. This is man's idea alone and such cannot be found in the Design, which this theory has defined to be packing infinite space with infinite substance. If we enquire carefully into this, it will be found that so far as we, human beings, are concerned there is nothing really to shew to this effect. The most a man can say is, that he eats because he feels he must. It may be known to him that food sustains him and thus prolongs life, but there must be millions of living organisms which take sustenance without this forethought. A drowning man, if he can swim, swims because he must; if he cannot swim, he struggles for the same reason. He may never be able to think over things calmly allowing him to gain the idea he is trying to save his life.

Correctly speaking, if a feeling of Desire precedes a responsive act the deed is said to be voluntary; for no one does things by volition without a wish. Whereas there are many forms of activity, which are not preceded by a wish or desire, and these certainly cannot be classed as voluntary in nature.

Now, volition is considered by us to be a part of the Universe, owing to its nature being of the active type; and from such it follows that any design, that we may postulate in explanation of our action, may have nothing in common with the Design of the Universe.

Beauty, Utility and many other abstractions are our own making, and have no position of that nature in the Reality. Over such there never has been universal assent, even if we exclude the assent that can be derived from animals. And so with eating to live; there have been and are human beings who eat and abstain from food for their own diverse reasons. People commit suicide; and though they may be classed as lunatics, they

still are living beings, the factors under discussion.

This short digression may help to shew the reader, that after all we are but creatures of circumstances, and that we have a right to defer investigations of the consciousness, fixed as an impressionable plate in the Ultra-reality.

And as a recapitulation, it can be stated at this conclusion of the chapter, that all physiological and mental activity as manifested to us in all living organisms is in the Reality an interference of intersistence of our spacial units; and that it is presumed as highly probable that consciousness of the manifestations of the Universe has been only possible in that deflected gravity does appear transformed into vital units.

And as a prediction it can be laid down that a living architecture as a medium will shew absorption of gravity to a much greater extent, than inert matter. And further, that since we have associated the vital units with mentality to a greater extent than with any other physiological function, the most active brain, volume for volume, will shew the greatest deflection, or as physicists will naturally put it, the greatest absorption of gravity.

In conclusion it can be said, that even scientists agree with us, that things were simpler as we recede into the past; and to this purpose an attempt has been made to shew, that knowledge of the primordial unit will render the reality of life in indisputable terms; and when this is accomplished future humanity will be able to recognise more clearly, that the Ego, with only one identity, reflected in the Universe stands passively before the work of the Creator.

In dealing with Life in the foregoing pages, we had wisely, though unwittingly, passed into a discussion on the nature of mentality. Man knows his mind, better than any other physiological function; and if we are satisfied as to how mental activity comes about, it is now only necessary to treat other vital or physiological functions in a general way.

The vital units, which we have presupposed to stand on a par with all our other units, having done their duty in explaining why Consciousness is impressionable can be now used in explaining the other physiological functions of all living organisms.

The ship that sails against the wind, resembles the gas, which not only exerts a pressure upwards against gravity but diffuses, as if it were a living body. Without gravity we could not account for the pressure of a gas and at the same time intelligibly acknowledge its weight. Elasticity, or better put vibratory movement, in cohering systems could only be accounted for by such taking place in a gravitational field of our construction. But whereas in these cases, we saw that gravity could be deflected into thermal units, with a living system it was necessary to deflect gravity or transform it into vital units.

A most misleading feature lies in the fact that probably all thinking people believe that food gives strength; though I think that in India, at least, there are men, who certainly do not act up to that belief. Thus, it should be possible for the reader to believe with me, that food only renews the living architecture so as to enable more and more gravity being converted into vital units, which like our thermal units shew in their nature, that they are, as it were, peculiarly predisposed to remain within a coherent system.

Though it is considered that Heat radiates with the same enormous velocity of Light, it is certainly very sluggish in conductors; and as far as we know conductivity is not represented in this form in Light. If the eclipse of the Sun took place more suddenly and not so gradually, the velocity of radiant heat might be found to be far sort of what it is generally supposed to be. It has been stated by balloonists, that no appreciable difference of temperature was recorded during and after eclipse. Be this as it may still a matter of doubt, the slow transmission of nervous pulses resembles the sluggishness of heat in conductivity, more than the high velocity of an electric current. The smaller velocities of alpha particles,

as compared to the beta corpuscles or negative electrons, and these again compared to the more sluggish molecules of gases, tend to shew that velocities are characteristic, and there need be little doubt that the same characteristic will be found to be connected with our vital units.

Again Heat, viewed in our way as units having form and intersistence, certainly behaves some what like a living thing, in that it tends to ascend against gravity. Of course, if viewed as molecular vibration that predisposition of Heat cannot be entertained; but I may remind my readers that the corpuscular nature of Light is rapidly being recognised, and Heat eventually will be treated likewise.

Botanists, I think, will agree with our exposition to treat gravity as we have done. The growth of all plants is mainly governed by gravity. The root grows to where there is least resistance, no doubt thereby obtaining food, but otherwise a plant generally fights its way up against gravity. True, it might be held that the direction is in line with the maximum light, which in the tropics corresponds more with the direction of gravity, but not only do experiments shew botanists, that gravity has much and possibly everything to do with the direction of growth, the upright growth of all trees at higher latitudes precludes Light from raising an erect structure.

In a later chapter it will be seen that the life-like ascent of water in a capillary tube, although such is directed against gravity, without transformation is due to gravity.*

In this way then Growth receives virtually a purely physical explanation without the aid of any vital energy or deflected gravity. But just as capillary action developes heat as well as motion, we can believe that Life, a transformer of gravity, is also built up by the direct action of gravity without transformation. We are inclined to pre-suppose from this, that the highest forms of Life, as ordinarily accepted, are greater transformers of gravity, than the lowest forms of Life, which more

* See Chapter on Predictions.

simply constituted as cells derive much of their activity from gravity directly, as has been held to be the case with liquids and gases, recognized by the Brownian movements in the former. Indeed this type of activity can be witnessed, but in another plenum, by watching the oscillating grass blades in a moving stream of water. Simple as that motion may appear to be, its production is complex, as all vibratory movements are found to be.

Then, when we consider the nature of the activity of many an insect, in that some are entirely unprovided for taking any sustenance, the food theory of power has no place. And yet scientists continue to make us believe, that that energy is derived from the molecular constitution of the insect without loss in weight or change in appearance. But when they come to deal with larger muscles of the Vertebrata, they have to admit that the powerful contractions and extensions, which could be explained by variable heat temperatures, cannot be derived from the energy of the nervous impulse; even if such were transformed into heat capable of accounting for the contraction phase. They are forced to hide their ignorance once more in Potential Energy, and on this think all has been explained.

A frog's heart dissected out, *i.e.*, clear of the body, continues beating for a considerable time, and fatigue and total cessation of activity appear more connected with alterations in the architecture, than with a depletion of the "potential energy" resource.

Just as we learnt, inertia in the form of cohesion by existing in gravitational field could develop elasticity, so must we view the growth of living tissue in the same way in a gravitational field. A drop of water must assume the spheroidal shape it does, and so must the structure of a living organism assume its form; for the guiding hand, that directs this, lays in the nature of a gravitational field.

We say that in a field of luminosity, the nature of that plenum entails that chlorophyll shall disintegrate carbonic acid gas. Did we not recognize the luminous

atmosphere as a store-house of energy, to this day we would fail to understand the seemingly spontaneous disintegration of that gas. Take away gravitation and we aver, all activity in the Universe would disappear; and more, we can believe that orderly co-ordination of units in systems, perfected in minerals and living matter, could no longer remain our manifestations of to-day. For the hand, that fashioned them has been taken away.

Heredity, therefore, has no place in this theory. We turn to gravity, and must rest contented, at this stage and date of the elaboration of this theory, with the assertion that the functions of Growth are governed by the gravitational field in which they take place. However this matter is again discussed in the following chapter on Evolution.

We can now indulge in a little speculation as to the origin of matter. For it will be seen that in dealing with Evolution or the nature of our Design, just as the origin of Energy in its diverse forms was accounted for by deflection of gravity, seemingly Dense Matter* should be treated similarly. Then, since the Mind, of all things, bespeaks more clearly of, what may be safely termed, spontaneous generation of energy than any other architecture, it is wise to look in that direction for the spontaneous generation of matter: by which, of course, we mean the transformation of the primordial gravity units into dense systems.

We are not alone in Mankind, who dimly feel that the developement of a massive complex living system from a simple cell adumbrates something more than simple integration and differentiation. Indeed we, like the rest of mankind, suspect a Creator. Evolutionists pretend otherwise, but their inner hearts are betrayed by their nervousness. Biology does not bathe in Physics freely; there is a considerable amount of awkwardness. The heat formed in a hatching egg is not exactly conformable with the chemical expectations: The photo-chemical energies with chlorophyl do not meet the

* Note;—Units in co-ordination forming a System.

requirements of the disassociation of carbonic acid gas : In short the metamorphoses in Life are still an enigma to all honestly thinking biologists, who mean so well. Bacteriologists who probe deeper, like the anatomist with his blood corpuscle, realise the force of this adumbration, but still declare spontaneous generation assuredly must be impossible. Yet not impossible,—because there is that dim feeling gained from experimental errors and accidents that it might be so.

Ordinary people meet with the same evidence, that development and growth at times do not appear to be balanced by the in taken food. A newly born calf and many young seals certainly undergo enlargement without sustenance, much like the simple fertilized cell increases its dimensions in an accountable way.

We can face this matter squarely in that we know energy and matter are the same substance. Therefore, there can be no hesitation in assuming, that living organisms can be the centres where gravity is deflected into dense matter.

This enunciation may be considered as extraordinary and in antagonism to all experience ; but on deeper investigation the reverse opinion will no doubt be entertained. Though it strikes at the root of the Indestructability of Matter, it is in consonance with this theory, which insists that the diversity of manifestations is due to addition and not to a make-believe evolutionary transformation business. That the Infinite Space should contain a finite quantity of matter appears to have no reasonable sanction. Why not more or less? Why a definite quantity, which appears infinite, but cannot be, in that we know there is space still unoccupied? For an infinite line necessarily consists of an infinite number of parts ; and even if alternately succeeding parts be eliminated from the computation, the remaining parts still must continue infinitely ; yet to us, they certainly appear as less in quantity than the infinite line.

Therefore, has it appeared wiser to us to accept the Design, where infinite space is being packed with sub-

stance, and the infinity of Time allows of this being indeterminably extended.

Then, are we in a position to determine the foci of the appearance of dense matter due to the packing together of those primordial units, we have identified with gravity. Nor have we asked any readers to conceive anything more remarkable than Newton's assumption of action at a distance. In fact, we have shewn by the nature of addition and subtraction that such must be so, as long as man insists upon tracing the origin of everything from "Nothing."

Simply because a chemist in dealing with minute quantities of dense matter has, as far as his balancing powers have allowed him, found that there is always a decided tendency to equilibrate into constancy of mass; that by itself is only of empyrical value, and has as much value as any other data empyrically gained. Until they can tackle the whole of *their finite indestructible matter*, they are not entitled to rule out any other reasonable contention to the contrary. And more so, in that when there happen to be discrepancies in the weighment of mass, as there has lately been between Cambridge and London balances, the incongruity is without hesitation ascribed to faulty mechanism, and not to other altered gravity conditions.

But with living objects the chemist has no facility to deal with these as molecules possessing mass, anymore than has he power to treat radio-active emanations as such. In the latter cases with his knowledge of the identification of the alpha-rays with helium, he is bound to think and speak of imponderable matter; and will even give a life of many thousand years to some dense substances, which we would extend infinitely; for we believe the Universe is suffering from Addition in excess of the subtractions: meaning in the long run there is a gain of matter at all foci of concentration.

And when we consider that certain elements as Hydrogen, Nitrogen, Chlorine and a few others are entirely missing in the chemical constitution of the deep

seated rocks of this planet, in asking, "from whence they came?" it can be hinted, that the living foci may be producing one or some of them even at the present date. For we are not believers, that Life originated on this planet so many years back, at a particular time of a certain day, and at a particular place.

Now, as the higher evolved life shews a larger retention of nitrogen in its composition, and the monsoons with their great outbursts of rain indicate that hydrogen is evidently reaching our Planet from without, thus increasing the humidity or wateriness of our globe, I feel inclined to think that Life is the focus of the generation of dense matter in the form of nitrogen. Hence, if it can be proved that a hatching egg or fledging chicken can shew an increase of unaccountable weight, presuming this dense substance is derived directly from gravity, so would it be interesting to see, whether the nitrogenous portion was in excess of that abstracted from the atmosphere. An experiment is practicable and might give these unexpected predicted results.

We can account for the hydrogen of our waters by believing that that gas to be existing in the instellar space, in so far it cannot be traced to the normal constituents of this globe; but chlorine and nitrogen, if introduced thuswise from without, would have been bound to have made their appearances in our atmosphere in combination with the normal oxygen atmosphere and the hydrogen of the interstellar space introduced. This is not so; hence we can believe that both nitrogen and chlorine are, and have been, formed by living agencies.*

The coal formations which are particularly free of nitrogen in that quantity the composition of organic substances of plants entails, have apparently given their nitrogen to the atmosphere; and the deeper we go down into the earlier fossiliferous regions, the diminution of chlorine points to the belief that the earliest waters of this planet were fresh and never saline. This also tends

* Note :—The transmutation of nitrogen into hydrogen lately effected by Rutherford does not vitiate this presumption.

to confirm the expressed idea, that chlorine has been created by vital agencies.

Possibly this origin may have every thing to do with the abnormalities of the halogen series. They alone produce acids with hydrogen in the absence of oxygen. Even nitrogen in combination with carbon is able to shew its acidity without oxygen. The atomic weight of iodine, judging from the chemical periodicity of properties, should exceed the element tellurium; but strangely it is less. Even bromine has an atomic weight just exceeding selenium, when the difference should be far greater.

That the advancing chemists are determined to trace back even the constituents of the elements to a primordial element like Helium is certainly the case; and if they are satisfied that Helium is the electrically produced alpha-ray corpuscle, the reader imbued with modern science need not feel alarmed, if we are trying to prove that some abnormal elements are produced by vitality. Radio-activity and vitality thus may have something in common.

Such conclusions are to be derived from this theory. And though such in continuation becomes a digression an author should avoid, it seems to me unwise to postpone these views any longer from receiving publication in this book. Our difficulty only lies in the nature of our units; but definite results are to be expected, if we are guided by intersistence viewed in the Time \times Volume aspect; though we must always suffer as long as we are undecided, as to whether the primordial units of gravity are all similar in form and phases, or that such exist in the three simple forms of the Tetrahedron, Cube and Octahedron.

And, if it can be proved that the architecture of a living organism is able to deflect gravity into dense matter, though only in minute quantities in a life time, we can consider that the deflected gravity in the centre of a sun or planets builds itself up into the other elements of the deep seated rocks. In this way our Nebular Theory *

* Our Nebular Theory (a misnomer) builds chiefly from the inside. Outside additions are dense matter.

of the Universe is more competent to account for the natural heat of celestial bodies, which is being radiated outwards without any signs of diminution. All such bodies when in the dense state necessarily will be under enormous pressure at the centre; and in this case, those gravity units, which have not been deflected into the various forms of energy, will go to produce the internal production of elementary dense substances.

Then, seeing that the visible celestial bodies are all incandescent with heat, which we have derived from their respective gravitational fields, it is easier to believe that our colder planets will in time not only be magnified, but will become hotter and hotter to incandescence. If the process is reversed, then there is that unanswered question, "from whence do the Suns derive eternally their heat which is dissipated into space"? Nay with the process reversed and gravitation being a force acting at a distance, an ugly discrepancy arises, in that the mightiest bodies should be the coolest; for, even, the energy imparted by desultory collisions must dissipate. But so far as our Sun is concerned astronomers cannot account for its eternal heat by bombardments or even contraction. Indeed if these mighty cold bodies were there, they would frequently eclipse the more distant incandescent Suns. But is such observed? Those fixed stars which suddenly flash into life and then disappear seem to indicate occultation has taken place, but in those examples I think displacement of light produced by refraction or deflection is absent, which therefore disallows this presumption being made. Generally, I think that astronomers do not favor the idea, that cold and opaque celestial bodies in any way exceed in mass that of the luminous spheres. On this we are forced to assume that all existing planets and satellites are tending to radiate out ever increasing quantities of energy.

With the cold moon staring us in the face, and the geological records bespeaking of a hotter earth* than our present one, the reader will dissent. But will this be

* In Nature, June 17-1922. Mr. Coleman dissents from the molten earth genesis theory. We agree with him.

supported on recognizing the conditions of the planets, Saturn and Jupiter which should have cooled off first. Leaving aside the nature of the dynamical equilibrium of the Solar System, Saturn with its constantly changing appearance and its rings, which can neither be solid or fluid from Newton's gravitational point of view, appears to be in the act of throwing out satellites. This really would be in contradiction to be a nebular hypothesis, if we differentiate between ordinary Cohesion and Dynamical Equilibrium.

A solution to such contradictions may be explained by this theory, if we accept that the formation of dense matter out of the primordial gravity units is a process of evolution.

Chemical union by no means implies expansion in volume. As a matter of fact, a chart shewing the relationships of the Atomic Weights and Densities of elementary solid or liquid substances, clearly separates all those elements which united with oxygen shew an increase in density from those that shew the reverse. The partitioning off in the chart is orderly, and there is no confusion. Chlorides behave in the same, and we can presume this will hold good for many other compounds. As an instance: the oxide of aluminium, as a ruby, has a greater density than either of its components entail. Oxide of iron does not. This means, that if a body were composed of aluminium, and oxygen was subsequently formed, (we will say inside it by gravity as explained above,) the volume of that body would have to decrease in order that the oxide on being formed should possess the increased density.

Judging from those elements that form the main constituents of the crust of this earth, we are allowed to assume, that if any such chemical union is taking place in the centre, as the elements are being formed contraction must be taking place; since the main constituents calcium, magnesium, silicon, sodium and potassium happen to be those elements which form oxides denser than themselves. Only carbon and iron behave in the reversed way, and

oxygen obviously remains neutral.

Thus, as an elementary substance, a celestial body must necessarily grow in mass in producing the elements direct by gravity agency; but we have it, that expansion in volume can be forthwith retarded or the conditions may alter into contraction, if within such we introduce another element, which in combination renders the compound more dense.

However the reader need not be alarmed with this anymore than with the life-periods of radio-active elements. Most of our gravity units are deflected into other forms of energy and are free to leave the system; and it is probably only a minute percentage of those primordial gravity units unite to form eventually the elements of the Universe.

Chapter XVIII.

Evolution.*

In dealing with the constitution of the Universe, the absence of an early reference to a theory of Evolution must have appeared strange to the scientific reader. It is therefore as well to now lay out one chapter to that purpose, which will give us the opportunity of understanding more fully the nature of the Design as recorded in the earlier part of this book, as well as its position and force from the evolutionary point of view, necessarily entertained by all scientists.

I am unacquainted with the current exposition of this interesting matter, which has absorbed so much attention since Darwin first drew attention to a fundamental law guiding the appearance of those innumerable changes that we are able to witness in the Living World. But I am conversant with Herbert Spencer's elaboration of the evolutionary hypothesis.

The weak part of Darwin's view on this matter was, that though he would account for the origin of species by heredity and survival of the fittest, he failed to let his readers clearly understand that the above two factors merely perpetuated a change, but did not originate the same. In this respect Lamarck of earlier times appeared just as advanced as Darwin. The origination of a change was shelved, and the transmission of such by heredity was only brought into prominent light by Weismann some years later, who denied the principle of heredity which we can now term as Imitation or Repetition in Nature. Had Herbert Spencer with his law of the continuous redistribution of matter and motion carried his view of the evolutionary process beyond the living world into the inorganic kingdom, I have no doubt, that in his time we would have learnt something more decisive concerning the nature of additive properties in modern

* Note :— Considered as a uniform repetition of changes,

chemistry and inertia in physics ontologically considered.

As said before I do not know how this question is now being dealt with, and I am not placed in the way of knowing such as this book is going to the press. Thus any appearance of ancient history must be tolerated, it being somewhat essential this matter should be embodied in this book.

It is universally agreed upon, that a body free to move in space will continue moving in a straight line with a uniform velocity, unless deflected, retarded or accelerated by an additional force. It being presumed a force started the body moving from rest in the ordinary sense.

With us the unit interexists appearing in progression in a straight line. This progression is repeated reappearances in new positions equidistant at equal intervals of time. It is the most basic instance of Nature's Imitation. Manifested to us, it means that from moment to moment the unit behaves the same as it did before. All units do the same. It is a power of imitation, that cannot be disputed.

If we now bring in another intersisting unit, by interaction, that is interference, a change can be made manifest. This, in other words, is redistribution of matter and motion at that moment. It naturally is not continuous.

Our design or fundamental *modus operandi* of evolution is to pack infinite space with infinite substance, which in a way corresponding with Herbert Spencer's integration of matter and dissipation of motion. But as we have only uniformity in our basic design, we, so far, have shewn no correspondence with the opposite; namely, reception of motion with differentiation, which he termed Dissolution.

Reciprocal interistence of two units corresponds with fully packed space. The insistence of each unit is not lost; thus force has not disappeared. But such a system with absolute and complete reciprocal interistence can neither manifest motion nor weight, its inertia is

infinite. The absolutely rigid and the hardest substance, necessarily from this, must be that substance with the least density. As an example of this, the modern idea of a line of force can be quoted to give an idea, how reciprocal intersistence can be manifested for such can neither be displaced nor is ponderable. In correspondence with this we have our gravity units, of which the time of appearance divided by the time of disappearance is infinitely great; thus such a phase virtually approximates in effect to reciprocal intersistence. But packing signifies that the system is no longer a single unit, but a congregation of them; hence it is only in dense (ponderable) matter, that reciprocal intersistence can be sought for. The diamond with its low atomic weight, small density, infusibility, and extreme hardness gives evidence in what direction we must look for reciprocal intersistence of units; and knowing that a diamond can only be formed under excessive pressure, it is easy to believe the nearest approach to a system under reciprocal intersistence would only be found in the centre of an enormous dense celestial body. This would be consonant with the design of packing.

Herbert Spencer with his integration and dissipation of motion does never appear to reach a perfect finality in keeping heat as an aetherial activity. Even, if all matter of the Universe integrated or coalesced with him such motion would not be entirely dissipated. But there is great similarity in his idea and our design.

The formation of a crystal is ostensibly a process of integration effected by external additions to the system. The growth of a living organism is on the other hand a process of integration by addition to the inside. Both systems swell, but in different ways. Yet we have previously had dead and living matter contrasted, in that with Life it was found that when a living organism was impressed by an extraneous force, it could respond with a greater force which never was found to be the case with dead or unorganised matter. In this way Life appeared to be able to counteract the ordinary course of events; giving

it, therefore, a nature of dissolution, as opposed to integration. Admittedly therefore, we have not established the universality of our Design of Packing.

To overcome this objectionable incongruity, we do not propose to adopt Herbert Spencer's idea of duality in Evolution. For we cannot imagine, that the evolutionary design proceeds in two directions opposed to each other, any more than it is possible to conceive a body to possess motion in more than one direction at the same time. We, therefore, adhere to our contention that the Design or the nature of Evolution to be found in the reality of all manifestations has, as it were, no cross purposes.

If we watch a mechanic pulling his engine to pieces naturally we are inclined to consider this the reverse of integration. But, if we knew all that lay in his mind, it would be found that he is pulling it to pieces for the purpose of re-erecting it into what he considers a more perfect machine. And so with our design of packing or integration, when we know all, it will be realized to be so and nothing else. The Creator or Director of Evolution, which comes to the same thing, has a purpose, which need not necessarily be ours:—The moralist may be in disagreement with the utilitarian:—The animal need not, nor probably does, see eye to eye with Man.

Men like Darwin, have thought that there is a power in Life to sustain and perpetuate itself. For they certainly saw from the manifestations impressed on them that things were apparently laid out in that direction, and it could almost be added, for that purpose. It might as well be contended, that it rains for the benefit of vegetation, and plants grow to feed animals, and the Newtonian gravitational field is specially arranged for the constellations; and so on according to fancy. But if we bear in mind that the reality and the manifestations cannot corespond, we will not be misled by the latter in this matter. If there were no reality underlying the manifestation of this Universe, the whole business is a chaos: anything could happen. But Science avers to the contrary, and distinctly recognises a Guiding Hand,

Therefore if the basic process of evolution is integration of matter and dissipation of motion, we must not be misled by the manifestations of dissolution. In the words of our theory we say, that when a unit can intersist reciprocally with another unit, such is complete integration and dissipation of motion; and more, the conditions can never be altered. Therefore we are entitled to lay down our design as being an evolutionary process of Packing, comparable to satiety of the human mind, where there must be no room for more.

The agent of this is Gravity, our primordial units.

The continuously occurring fresh appearances of gravity in the Universe enables us with these primordial units to put the design in operation. With them we reach a unit of space, and by the phase of their intersistence we obtain a unit of time. Our addition and subtraction once more become the final deciding factors of our Universe. By accepting intersistence as the nature of things, the basic principle of the Reality, we reach finality in an orthodox way corresponding with the absolute.

A gravitatalional field has become the determiner of the innumerable manifestations of this Universe. For it can be put, that the gravity units are not only the substance of every thing, but that every change can eventually be traced to their interference. Nor could things be otherwise, unless we changed the nature of a gravitatalional field. The power of Imitation seen in repetitions is in reality effected by the constraining influence of gravity: The oscillations of a pendulum in their uniformity bespeak to the same: Under Cohesion we saw that Elasticity was derived from Gravity; and so can we believe that the creation and subsequent growth of an organic cell is directed by the gravitatalional field in which necessarily it exists. Yet along with this the design is in constant operations. Reciprocal intersistence is its culmination, and as this is being attained changes will be no longer be manifested to us, and Consciousness will cease being impressed with the reflections of itself in an

infinite Universe completely packed with one substance.

Science uptill now has not given us a satisfactory explanation of the uniformity of nature's operations. Repetition is the very basic of all uniform changes and it cannot be intelligibly seen, how repetition is going to be derived from finite continuums. If we would bring forward further logical support in favour of the basic principle of intersistence, it could be quoted, that to repeat an act, there must be a fraction of time in which the first act is not being performed before that the act is repeated. The three fold nature of this evident.

Science may be satisfied with the postulate, that mass at rest has Inertia and mass continues moving uniformly, which is that momentum once acquired by mass is unchangeable by itself. We are not; and therefore have shewn such to be repetitions by our method of intersistence of units, in units of time and space.

When a change takes place, Science without any warrant passes from continuums to quantum in an accommodating way. The transmission or repetition of properties of living matter, and we add the additive properties of dead matter, are somehow evolved out of their fundamental continuums. We cannot in that light see how. We maintain, there must be a director to enforce repetition of a change to provide for uniformity: for we should be agreed that only by this can repetitions be construed as continuums. Therefore how much more consistent are we in maintaining that Inertia in its uniformity consists of units of repetition, which is consonant with the nature of intersistence.

If we, as has been done, make mass out of our primordial (gravity) units by co-ordination of intersistences, we still use these units as directors of uniformity in the shape of gravitational field. If gravity were not so uniform as it is, there would be no uniformity in nature. A pendulum might swing anyhow; but it does not, for the same reasons that constrain a seed to imitate its parents.

The atmosphere of a nationality constrains the behaviour of its members. A person in solitude may do things, which in the presence of his fellows he would never follow out. Dissension eventually leads to an appeal to arms. A battle of angry glances or heated words is only the beginning and not the end. And so with our units, the gravitational field determines the nature and course of events. Evolution is not in progress in mid-space, where there is no co-ordination. Evolution starts with Cohesion, and where there is cohesion there is gravity in the act of concentration, which is known to us as a gravitational field.

If not, then it can be repeated, where lies the restraining influence producing repetition? Inertia alone cannot account for the diversifications in manifestation. If all primordial units moved uniformly in a straight line or remained at rest in the absolute sense and produced no interference with each other, like the radiations of Light travelling to the Eternity, it is impossible to conceive manifestations arising there out. Even, if by clashing and interference we produce diversifications, these could only be chaos. A restraining influence to produce uniformity, which is repetition, must be invoked; and in our Design we see that Gravity must accept that position

Otherwise we must continue doing the same in striving for simplicity, like Science has done in the past, by believing innumerable complexities will automatically resolve themselves to our satisfaction into Unity. This is not in our mind.

How dense systems are going to be constructed out of the primordial gravity units cannot be told here; nor can we estimate at this stage the number that would co-ordinate to form the simplest dense system possible; all we can state is, that every dense system is a nucleus or centre of packing. The Design in casting fresh materials into the Universe exercises the first step in packing infinite space, but the main principle is to crowd by aggregation. It might be said, that this evolutionary

process is based on reappearances of units in the most difficult, though possible, loci. This in the highest form has been indented with reciprocal intersistence.

The only arbitrary assumption we make is a mathematical device based on the recognition of $\text{Time} \times \text{Volume}$, by which we are able to consistently alter the phases of intersistence and thereby produce the manifestations, which we identify back into the Reality with the Universe. This as, the reader must be aware, has not been worked out; and for that reason must remain for sometime a weak point of this theory. Suggestions in what direction change of phases should lie were made in an earlier chapter. With Light the physicist jumped to conclusions in respect of the frequency and wave length as correlated to the velocity; and as we see that later knowledge is fast discounting the value of the aether plenum assumption, we can take heed from that, and not precipitate a decision as to the correlation of the phases of intersistence.

So far we must rest content with our firm conviction that whatever evolutionary process there is, it cannot be a compound one; and more, the purpose consistently indicated by its action need not correspond with any manifested purpose:—We must be quite clear on this latter point. In fact we can, nay must, look upon the innumerable plans and purposes man has intelligibly discovered underlying the manifestations as “bye-results”: that is as co-incidences.

No wonder then in Life do we see kind reproduced in various ways. Though sexuality seems essential for that purpose in the higher forms of life, here and there we get extraordinary differences, as in a-sexuality. This led to the recognition of two kinds of organic cells in all living organisms; namely, the one class that could reproduce and the other that could not; and this idea was carried out to that extent by Weismann, that it was considered determinants really lay in a germcell allowing such to grow into a heterogeneous whole: that is, all differences in the tissues of the developed form were

derived from these innumerable special determinants assumed to be lying in the original germ-cell of reproduction.

The reader is aware, that the reproduction of a tree with all its complications can be attained by nursing simple cuttings or grafting, and this can be carried out in the animal kingdom, even with such high forms as the lizard, where a decapitated limb, as the tail, is reproduced as a matter of ordinary occurrence. Weismann's determinants for producing tails apparently lie ready at the point of truncation; but why the determinants for producing an eye, nose or head do not occupy the same region, of course, is not explained.

Biologists, as a general rule, are so apt to confound crystallisation of a mineral with the reproduced growth of a living organism. There would be more reasonableness, if the aptitude shewn in chemical combinations corresponded with the proclivity of reproduction. For the lower we go down in the scale of life the greater is the dissimilarity between the offspring and parent. And such conditions are seen in chemical compounds: Sodium chloride, differing from its elements, can be viewed as the offspring of either. The reproduction into the form of either parent is arrived at by disintegration under suitable circumstances. Growth is not necessarily reproduction, in that simple fission of a living organism can produce there and then two separate existences.

Though such is a digression it helps in pointing out that Science, without having defined a system, is apt to see correspondences where there are none. For such reasons, in all probability, biologists seem to be going out of their way in denying spontaneous generation; although admitting that the principle of reproduction entails the creation of separate existences: These we call systems. Hence their difficulty in tracing evolution throughout the Cosmos in a consistent way.

However, be a system composed of electronic units in dynamical equilibrium or spacial units intersisting in co-ordination, the fact stands out the quantity of units

engaged in manifesting Life is a very small percent of the total units which go to constitute the Universe:— A permanent quantity in modern science, but a variable quantity with us. Hence, even although Life may, nay does, appear to be reversed in action to that of integration and dissipation of motion or as we put it, in the form of packing, it is not incumbent on us at this stage to recognise a duality in the universal process of evolution as previously explained. Therefore in conclusion we can state that in this process of packing infinite space with substance (primordial units) the manifestations of repetitions or uniformity of changes are bye-results: co-incidences, in that our observations of the systems of the co-ordinated units necessarily must be made in a practically uniform gravitational field which entails uniformity of changes or repetitions. Alter this gravitational field, though the process of evolution is still the same and the principle of uniformity of changes still continues, the manifested changes are altered, as past geological evidence of life clearly shews. Take away Gravity entirely and the uniform action of Evolution would disappear.

Chapter XIX.

Predictions.

At the time of the elaboration of the theory, I was unaware that the intensity of the force of gravity behaved anomalously in depth below the surface of the earth, in shewing an increase of strength as that compared on surface. The theory predicted an increase; and I still remember the uncomfortable feeling I felt at that stage, seeing what grave issues were entailed by it. When, however, I was able to read, that the Director of Survey of India considered the higher result obtained in Kolar in depth was anomalous; I could view it that not only was my prediction verified, but that the increase of the force of gravity in depth was an unexpected result.

I may be trying the patience of my readers with these personal matters, but it is my wish to shew that the value of a prediction of an un-anticipated result should not be minimized; because it happens, that an experiment has been previously resulted in favour thereof. To me it was a fulfilment of my prediction, and I took sustenance therefrom; and thereby was able to steer my course more easily in the elaboration.

The absorption of gravity was necessarily another prediction: and though I pleaded with a scientific Body for facilities to experiment in that direction, they must have viewed my ideas as imbecilic, in that facilities to experiment were not to be obtained. The balance stared me in the face, but it could not be used for my purpose. Surreptitiously I was able to detect absorption with both my hands appropriately placed over one side of the balance. But that experiment; though in my favour, was not subsequently retried; for I still hoped proper facilities would be at length granted me. Disappointed in this again, I admit loss of temper did not improve matters, nor were experiments continued.

Majorana as we have seen, subsequently and of course independently, verified this fact using mercury and lead as his absorbing mediums.* He, from accounts, appears to have definitely determined the loss in weight by direct weighing. My method was to treat gravity as a fluid in downward motion and derive momentum in the balance by impact. For that purpose the medium absorbing gravity would be placed over one side of the of the balance as that side ascended, and immediately be placed over the opposite side to absorb gravity in that position as the beam ascended. In other words I was, as it were, patting each side of the balance so as to increase the swing. Measurement with a medium above a pendulum might lead to interesting results, but as the swing is very small, this patting method would not be practical. And should the force of gravity vary in time, which exhaustive pendulum experiments have proved to be so, the detection of absorption by a super-imposed medium would thereby be interfered with; and this would be difficult of elimination or detection.

For us, then, a balance with long beams seems essential for obtaining perceptible results. But considering what the nature of gravity is under this theory, it seems highly probable that a long beamed balance, measured in feet and not inches, might even be able to respond to variations in the intensity of gravity in such extended positions. If so, then a long beamed balance would not reach a state of rest in regular periods of time; if indeed it might ever come to rest at all. Hence such apparently would not be a perfect condition for testing an absorption of gravity.

I had a balance made on the top heavy principle, which would enable the beam on one side being extended to any length required. This allowed of the balance being adjusted for a state of rest to that degree of fineness that an "imperceptible" increase of force might upset it. I mention this here, in that I think that a delicately constructed balance of this type is worthy of being

* Note :— See footnote on page 128.

experimented with ; and it is not at all costly to make.*

Such are contrivances for getting direct results, but there are other ways of detecting variations of the intensity of the forces of a gravitational field.

Pendulum experiments shew that the force has apparently a diurnal as well as a bi-monthly variation. Hence in testing for absorption of gravity by mediums, it would be necessary to conduct at the same time and in the same place the usual pendulum estimations of gravity free of absorptive effects. I can foresee that there is going to be considerable difficulty with regard to eliminations of unessential variants ; but once this corpuscular idea of gravity is recognized, the corpuscular nature of light descending downwards with gravity will have to be taken into account. For in strong mid-day sunlight a body should weigh more than on a cloudy day or at night. Certainly Light appears not to deflect dense matter like the other forms of energy, but it undoubtedly will ; and therefore must affect the ordinary gravitational results. To my mind it appears from such reasons that the blueness of the sky perceptible by day and night may be entirely due to gravity, and probably this due to the deflection of gravity or its interference with the light units that are intersting throughout space, as diffused light.

As all experiments must be conducted in a gravitational field, it follows that all predictions must be based on such conditions. And it would be well, in the first instance, to ascertain as much as possible concerning the amount of gravity deflected even under normal circumstances.

Judging from the nature of Radium it could be said that those substances which normally deflect gravity into heat and other rays would posses the lowest specific heat of all substances, whereas those with a high specific heat would deflect gravity to a less extent. This would tend to the idea, that possibly all forms of energy can be reconverted into gravity again. Should such be the case,

* Note :—If the balance rotated alterations in intensity of gravity might be detected.

it would not follow that the substance alters in actual weight, but the amount of gravity normally deflected would suffer a considerable decrease. A distinction in effect, worth noting.

Taking heat as a deflected form of gravity for example, a substance at absolute zero as a medium would shew the least absorption; and we could really look for an enhancement of the force of gravity beneath such things. As we know by this theory that density is simply gravity units interfering with the dense units in any particular architecture, naturally the product of density into the atomic weights will form periods. From this it can be predicted, that the deflected gravity will be proportional to the atomic weight and vary inversely in some proportion to the density. In this way, we can predict, that the alkaline metals of low specific gravity will shew radio-active properties in excess of what can be calculated from their atomic weights. Judging from the known specific heats it can be stated that the higher the temperature of a substance the less gravity is deflected into heat; but there are facts to shew that the deflection into other forms of energy as light and electricity is enhanced. Incandescence is one example.

A host of different experiments conjure themselves up, if gravity is viewed as a flowing stream of energy; and I now mention some.

Any conductor carrying an electric current would always shew absorption to some extent, even if the direction of the current be reversed.* The alteration of the force of gravity beneath such a contrivance might lead to more details as to the behaviour of electricity as a current.

Bodies suffering electrification to one sign, and magnetization would likewise shew absorption; and it would be interesting, should this be so, to be able to note the length of time this absorptive effect lasts after active electrification and magnetization cease. It is also quite possible that the deflected gravity in the production of

* Note :—Electric currents flowing with and against gravity in copper and iron differ from the normal horizontal flows,

frictional heat would be detectable.

Nor should testing the effects of a disc rotating at an extremely high velocity be neglected. No prediction at this stage can be made about this. But a body vibrating is more likely to shew results which correspond with the heat developed.

The absorption of gravity during crystallization is another example, well worthy of attention; and especially so, in that I have suggested using this contrivance to measure gravity in airships by noting the differences in heat productions. Solution of salts, with apparent loss of heat, indicate that the force of gravity would increase below such mediums; and if such proves to be so, we have arrived at the unique experience of reconverting deflected gravity energy into its normal state; similar in effect to the recompounding of light.

The experiment to test any increase of pressure and temperature in a liquid or gas raised against gravity, or the reverse to be obtained in falling with gravity, seems easy and should be done; in that eventually we would learn about the normal amount of deflected gravity by all bodies. For anything travelling in the course of gravity's progression would reduce its temperature, and absolute zero could be reached if a sufficiently high velocity were obtained in the direction of gravity. This is probably proved by the intense cold of meteorites and hail.

Last, and not least, in importance is behaviour of living matter in a gravitational field, and numerous arrangements for testing the deflection of gravity easily suggest themselves. Eggs during the period of hatching appear to me to be ideal in this respect.

Then, when it becomes clearer to us in general that a gravitational field is a store-house of energy, the medical people will have to view dietetics and therapeutics in a new light. Medicines must be looked upon as being portions of our bodily architecture, and that by their assimilation the tissues are able to regulate the production of vital units from gravity. Even physically there is sanction to believe that by raising a man against gravity

speedily, such could develop increased vital units, possibly essential for health or for staving off death. I think air-men can generally testify to a feeling of exhilaration in rising rapidly, and to a depression in diving. Exercise is known to favour health, and this is only an ordinary means, whereby gravity can be slightly deflected above the amount deflected in a quiescent posture.* The same remarks apply to the art of massage. Reduced vitality in sleep induced by the quiescent recumbent position may mean a subnormal deflection of gravity.

I venture to predict that, in time to come, the materials of construction of habitations will be studied, and that open air life will have a greater claim on health owing to gravity not being intercepted; in contradiction to the idea that the fresh air is solely the benevolent agent. People in palaces with an equal amount of fresh air can invigorate their health by discarding a possibly very obnoxious roof: especially so, if there are many human beings in the top storey. Longevity of man from the Biblical accounts in the days of no houses supports this contention. Indeed, clothing must have its effects on health; and I even suspect that woollen goods are warmer, in that they are really continuously producing a small quantity of heat by deflecting gravity.

As our units of energy occupy space interersistently, it may be possible from such to account for the abnormal densities of gases. That heat appears to shew directly it occupies space can be seen in compression, though a few substances, like Ice and Bismuth, behave anomalously at and near their melting points. However, in such experiments the heat produced by deflecting gravity during changes in the compressive force has to be assumed to be of some quantity, and naturally must be taken into account in measuring the heat squeezed out. By heating a portion of a salt solution, it has been found,

* Note :—Swinging, producing an intermittent production of vital units, can exhilarate or depress according to the nature of the architecture of the body. The rhythm of breathing is undoubtedly affected; and I consider sea-sickness is entirely due to abnormal breathing, primarily produced by abnormalities in the deflection of gravity. A cure is therefore suggested.

that apart from the density being diminished, the percentage of salt in the heated solution suffers a similar diminution. Further study in this direction might reveal the nature of the behaviour of the heat units in a state of conductivity as opposed to radiation; for it appears as if the heat units are able to displace the salt units under those conditions. I do not know whether the osmotic pressure has been measured by trying to keep the two liquids on either side at different temperature; if no experiments have been done in this direction they are worthy of attention.

Experiments with shadows tend to shew the corpuscular nature of light.* If the shadow of a comb be thrown on a screen using sunlight for preference, it will be observed that at certain distances from the screen, the otherwise distinct shadows of the teeth become blurred and appear to be illuminated, so that the number of teeth appear doubled. According to our theory the units of light would behave much the same as dense units acting at grazing distance. They are therefore deflected and this will be inwards. Thus those units on both sides of a tooth are deflected so as to meet at a point on the screen corresponding with the natural position of the shadow of that tooth. The shadow in this way becomes illuminated, when the distance of the comb from the screen bears a certain relationship to the angle of deflection. It is possible with strong sunlight and open inspection to get 3 distinct positions for obtaining blurring of the shadow in this way.

If in the first position a space between two teeth is closed, it will be noticed, that as only partial illumination of the adjoining shadow takes place, the shadow is fairly distinct for that particular tooth. If in the second position and the same space is closed, it will be noticed that the shadows of 2 teeth appear; and three shadows can be detected in the third position. This is as we should expect, in that the angle of deflection always remains the same, but the base being increased for each position must

* Note :—Here we are in agreement with Einstein.

necessarily throw this deflected illumination further inwards and therefore into a new position.

Light coming through a slit does not give this blurring effect in the different positions, but if the slit becomes of considerable aperture, the centre light of such will behave as with ordinary light. This effect is easily seen by standing under a foliaged tree in strong sunlight, the shadow of that person undergoes considerable wobbling, if a wind disturbs the position of the leaves.

It cannot be a case of interference of light waves, which this theory of course rejects ; but it is clearly a case of deflected light illuminating a shadow on the screen.

By crossing two combs and throwing shadows in those three positions, the square hatch work shadow changes into isolated shadow dots, and then into diagonal hatch-like shadow.

The Black Drop or internal contact of Venus disc in transit endorses this postulation of the nature of Light at grazing distance. Although there may be space between two bodies, light cannot pass through such without deflection ; and hence darkness at that point grows more rapidly than the motion of the two bodies allows of it. To an observer in the penumbra, prominences undoubtedly visibly shoot the shadows out at grazing distance. As this effect is dependent on the light corpuscle and the dense body, a difference in measurements might be detectable by using different materials.

Experiments on these lines I think will shew the observer the corpuscular nature of light, and are worthy of being undertaken with this in view.

We are not in a position to say how far from grazing distance deflection of light can be made perceptible, but judging from the displacement of stars to be witnessed during the eclipse of the Sun, I am inclined to think the deflection takes place at a considerable distance from the deflecting body. This could be ascertained by setting out lines of sight for great distances at grazing distance and

increasing such until no deflection is noticed. Levelling operations close to the ground would follow the curvature of the earth more, than if the sight is high above ground. I would direct surveyors to this possibility.

To prove that capillarity is due to gravity can be done, if it is remembered that the direction of progression of gravity units at grazing distance is necessarily turned *into* the dense body. The adhesion of dust or particles to any body or of gas bubbles to the sides of a vessels containing a liquid are conclusive proofs of this assumption. Hence if we bring two solids so close together, it follows there are no gravity units that can progress normally in that space. This results in that the grazing gravity units on the outside of both bodies push the two bodies together. It would be interesting to watch the decrease in weight of a body as it is brought closer and closer to another body's outside surface: preferably of course smooth and in the vertical position.

When Ink is carefully let into the edge meniscus of a glass of water, it is found that one portion shoots away from the glass and another descends vertically as if it were adhering to the glass side. I maintain the meniscus is only kept in position by movement of the liquid and this due to the peculiar play of gravity. This is somewhat in agreement with the known fact, that the curvature of a meniscus is variable in time, even for mercury. Viewed in this light numerous experiments are awaiting being carried out; and I feel that by such incidently the anomalous production of heat during capillary action will be accounted for by deflection of gravity.

To continue making predictions would virtually amount to reorganizing the whole of scientific detail. This is more than the work of a lifetime, and certainly beyond the scope of this book; so I must reluctantly hand over this interesting work to those who are already virtually doing it. I am referring to the radio-chemists, who in their restricted line are well on their way in breaking into my Store-house of Energy: Though they know it not.

Chapter XX.

Concluding Remarks.

With a sense of relief, I feel this book can now be brought to a conclusion. The subject, necessarily, has been vast and transcends the power of an individual. The exposition of the Reality underlying manifestations is not the work of a life-time; nor can I see that a finality will be reached within my time. Though the basic principles enunciated may be correct, the elaborations, which give this theory solidity, seem interminable; and this want of finality leaves room for a feeling of uncertainty, as to deciding whether to discard the fundamental ideas of Modern Science at this moment or not. Yet unless more than tacit acceptance has been made, I fail to see, how the elaborations can have been of any value. But whether the reader adjudges the theory from the elaborations, or accepts the basic principles and notes the ensuing logical conformity of the working out, is a matter of indifference: The point is, has the reader accepted my idea of the nature of Consciousness. If not then the trinity of the Universe, Space, Time and Substance, will with difficulty be treated as a whole. This would introduce a point of weakness; for it must be borne in mind, that vital units as a form of energy enabled us to explain mental activity and sensations, and these are the only channels through which the Reality could reach us as manifestations impressed on Consciousness.

However, greater satisfaction was derived by allowing the theory to embrace mentality along with the question of Life. Similar results could have been arrived at under their separation. But we can congratulate ourselves, that the former course was adopted, thus allowing of the passive nature of Consciousness not only being accepted, but permitting us to treat the Ego as a thing of the Ultra-reality without substance, and beyond time and space.

To every thinking person, no matter in what way the Body comports itself to the Soul, a feeling from introspection arises that a beginning and an end of existence is impossible of conception: This can be put, that identity of Self is boundless in Time. Then, again, no matter how much the body may be dismembered, the identity of Self continues unabated: Clearly this means, self does not lie in Substance; and as we only know of Substance as occupied space, it is futile trying to locate oneself or any other soul in the Universe. Far wiser would it be to recognize this at the outset, and agree to the materialistic nature of the Universe, and continue believing, as we have done, that there is a Reality apart from ourselves, and that we are only conscious of it, owing to the vital units being the deciding factors. Death is explicable by their absence. For if there be no light, we can conceive the Universe plunged in darkness: Time, Space and Substance will not therefore pass away simply because they happen not to be impressionable.

All this becomes clearer, if it is realized that there is only, what may be termed, momentary Consciousness. The picture impressed on Consciousness is substance painted in space and time; and we can consider, that an observer, who sees his image by reflection, is entitled to assume there is something reflecting it: And in our case, this something is the Universe. And the simile can be extended: A warped mirror entails an altered image, though the observer remains unaffected thereby. So it is, that a change of impression of Consciousness is our knowledge of the Universe, yet our identity remains the same.

It is therefore hoped, that the reader not only has realized the nature of the relationship of Consciousness to the Universe, but has seen that knowledge by reasoning and that gained by perception are no longer to be contrasted, but have a common origin in the interference produced in the architecture of the brain and neural tissues by vital units: and this entirely due to such being located in a gravitational field.

Beyond this it is impossible to go without trespassing in the domain of the Ultra-reality; and it must be considered an advance for the time being that we have a coherent interpretation of consciousness, and are thereby able to speak of the Ego as if projected into Space, Substance and Time.

The reader, who in conscientiously turning over these pages has reached this one, can be trusted to see that the metaphysical speculations in the book could not be avoided in that they virtually consolidate this theory of the constitution of the Universe. Indeed we can view our result with pride, which bears no trace of inconsistency. Not like Science have we eliminated personality, the deciding factor of all knowledge; for we were bound to think out a reality in terms consistent with logical recognition: That is, if the Reality was based on addition and subtraction, those processes were identical with our mental activity. It was impossible to think chaos was the ultimate nature of the reality underlying all manifestations. Hence the Design was forced on us, as a process of Evolution was essential to Science, which we claim to have surpassed by differentiating between Man's desire's and the purposes of that Power in the conduction of the Universe. And as we give the Ego no place in the Universe, we are not obliged to personify the Creator, any more than try and picture our e-carnated souls as hanging about with portable instruments of communication.

Obsessed with the idea that a trinity in the reality is a unit in the Ultra-reality, I place myself in the hands of arithmetic, and rest contently with the firm conviction that I can never be persuaded to confound the inconceivable small with zero, or the inconceivable great with Infinity: nor can I be persuaded to believe that the multitudinous diversifications of manifestations can ever be explained with a finite quantum of Matter or Energy dumped into the Universe without introduction or references.

The measures adopted to reach the Reality I admit have been drastic, but any other course more conformable to modern ideas has not been open to me. To undertake to piece together the multitudinous variations in scientific thought and construct a coherency entitling such to stand for the Reality, even if possible, is not in my power. The theory of Relativity in order to shake itself free of the aether and its peculiar mode of transmitting energy has been obliged to hold abnormal conceptions of space and time in order to adhere to action at a distance. Where we have relied on common sense in forming a conception, Relativity trusts to algebra or the language of contradictions. We are at one with Relativity, in that there is no middle to that which has no extremities; but we differ over a "boundless" finitum as a reality without an ultra-reality, in that it seemed more preferable to let consciousness contain the infinite. So once again the ultra-realistic nature of the Consciousness asserts itself.

An author dealing with so vast a subject has many misgivings over the feelings of the readers. Desirous of bringing conviction by any means with an honest purpose and not knowing the idiosyncracies of each particular reader, it is impossible to collate without some embarrassment. I should therefore be pardoned if a recapitulation is made by bringing forward certain points for assisting towards a stronger acquisition of the essentials; and a short history of the genesis of the theory appears to me should precede such.

When thirty years ago we were taught that the atom was indivisible there must have been many students of science, like myself, who would have put the question, why? had they been allowed to; for there was a feeling that though there could be nothing more solid than a solid, yet finer and finer division enabled us to pass through liquids unto gases and then on to radiant matter, which was then undergoing research. The idea naturally occurred to many, that extremely fine matter and transportable energy were constituted of the same units, and therefore they were one and the same thing. The idea,

which I can still well remember, could not develop owing to the conception of Kinetic Energy, $\frac{mv^2}{2}$, being matter in motion. Matter itself therefore under this view was not Energy; since this had previously been supposed to be but a finer subdivision of matter itself.

In those days matter at rest could not be twisted into resemblance to Energy by the logic at our disposal, and we had to remain contented with a differentiation embodied in those two great fundamental assumptions of Conservation of Energy and Indestructability of Matter. No wonder then that Light and Heat always considered as forms of energy were bound to be expressed in the kinetical form; and since such, in those days, could not be considered as emissions of Newton's imagination, the adopted aether wave explanation reigned supreme.

I took another direction. To me it appeared logical to state, that since I could not conceive anything moving through space, unless that thing occupied space, and since it was admitted Energy moved through space, clearly Energy had to occupy space. Matter behaved in the same way; therefore it was then clear to me, that either energy was matter or two varieties of substance constituted the Universe. The latter idea naturally did not appeal to me, in that as mentioned above, the prevailing feeling was that the ultimate units of everything must be the same thing.

Was my logical asseveration a step in proving that such was really the case? If it was, then clearly energy in motion could be comparable to matter in motion: or in other words energy was matter. In this way a statical conception of energy was possible. But the reward was short-lived in that an emission theory was again confronted, entailing action at a distance to be illusory; and force, the power of doing work, to be Energy.

Determined that a logical conception was of greater scientific value than empiricism, and action-at-a-distance founded on fact was otherwise inconceivable, this force could be eradicated without detriment to the tenor of rationality. The theory in mind at that stage was there-

fore more concerned with the repudiation of Newton's gravitational field, than with the ultimate units of substance. Acceleration in motion peculiar to those forces acting at a distance suggested at once an emission or corpuscular nature of Gravity, for it was easy to realise an ever increasing motion of a body could be due to a continuous series of forces of impact. Unfortunately the Kinetic Molecular Theory had been established, where we could have expected accelerated motion, but only uniform pressure was obtained.

The reader will now appreciate the embarrassment occasioned by conflicting theories in a mind desirous of bringing about a reconciliation. Common sense with its unified Reality looming in the distance could not be rendered void; the obvious had to be attained, even if it had to be reached by guess-work. No wonder then that motion received analysis, which led to every importance being attached to the conversion of zero into a Quantity or the reverse. Chapter II has dealt with this, the results of which forthwith challenged Algebra

The mind was now free and untrammelled with conflicting ideas, which could be discarded leaving a new Science for reconstruction on the basis of intersistence of the units, which from that nature could remain absolutely indivisible.

The idea was a drastic alteration of all conceptions of matter as known to us. It was not a case of why did units intersist, but how could they. But the inconceivableness of such conditions in the Reality were to be over-ridden. Science had never defined a system. The units it dealt with were irregularly coherent, unified and mostly hypothetical. Quanta were only an after-thought of Planck of special and not general significance: Indeed it could be said that science under a quantum theory is not science as we knew it; and science under Relativity similarly has not only new clothes, but is mathematics without normal conceptions, neither with recognised systems in the Reality other than as mental symbols.

Now this difficulty of conceiving intersistence as being the nature of the ultimate units I feel will be considerably magnified by dissentient critics; it is therefore well to meet anticipated adverse criticism while I am in print.

The conception of a potential force by physicists is virtually a conception of annihilation of momentary or lengthy duration. As shewn in Inertia the force is potentially hidden: Therefore not in evidence. Now as force does not occupy space, in what does it exist in its potential form? In its kinetic form it certainly lies in substance.

The conception of potential energy is akin to the conception of potential matter; for there is no doubt modern physics is going to permanently identify the two, though in a different way to our logical presumption. This potential energy lies where?

The conception of transformation of energy is nothing else but annihilation of one form and the creation of a new form in modern physics.

There, then, in these three examples we find man has conceived, or imagined he has conceived, annihilation and creation. Mathematically his mind can convert this into a fact. If that has been possible, then why should there be a difficulty in conceiving intersistence being the nature of the Reality; and especially in that we have a feeling that the Reality in nature will, quite possibly, differ from its manifestations. And it can be said that this is very likely to be truth, for if the manifestations and Reality were identical we would be living in chaos.

Latterly in connection with the supposed vitreous condition of solids, the idea has arisen that the molecules may be pulsating. By all means let them pulsate by nature, which would entail annihilation and creation of substance. If on the other hand they are going to pulsate like frogs in a pond, that theory, like all the rest, is going to invoke the art of casuistry.

However because others may have bungled, that is no sanction for us to become casual. Therefore we can

fall back on the fact that no one has measured the finite quantum of matter or energy in the Universe, and as long as this has not been done there is no direct proof that intersistence is impossible. Its probability has already been shewn in the earlier part of this book; and further without intersistence of units Motion is incomprehensible and phenomena cannot consistently be interpreted.

The conception of intersistence must be made; for inwardly we feel there is no continuity in anything. The quanta of thought are as distinct from each other as can be: and how can they be existent, when they are not? How are we going to believe that all the separate existences of living organisms are not creations? What were they before birth and what are they after death? Persistency is explicable by repetitions, and repetitions are *is-and-is-nots* wherever they occur. The motion of a pendulum is annihilated twice between each swing, but the oscillations persist. One vibration of a tuning fork will not develop a musical note: Is the note developed from nothing or created? where does the heat go when absolute zero is reached? What is electricity when the opposite signs neutralize each other?

Such should suffice to meet any honest adverse criticism in regard to intersistence, and we can now proceed with other and more tangible essentials.

This book could have been entitled, a refutation of action at a distance or an interpretation of gravity, since in elaboration of this theory of Intersistence we were not only driven to recognize the ubiquity of gravity in all phenomena, but also its nature as the foundation of all things. If we have made out a case that there are gravity units, there is nothing to forbid the supposition that these are the primordial units a unified Science has considered essential for its existence*

* *Note*:—The reader who has dissented from this must resume his peregrination in Space and discover the centre of gravity of that finite quantum of matter that is supposed to lie in a "boundless" finitum; and with the coming identification of Energy and Matter will no longer be able to dissipate his heat of disintegration indefinitely. In fact the result of all this can but end in a cold lump being found in Space, the end of Evolution and hence all phenomena. We are at least prepared to go on for ever by

We are not therefore obliged to solicit aid from Special Creation, which must be contrasted with Intersistence. Given our primordial units up to a limit we need not call upon any fresh production for a particular manifestation, but if the diversifications in manifestations shall continue we insist upon additions. If the Design were reversed the game would be played backwards and infinite space could once more become empty. Whichever way we view it, additions produce the novelty, the persistency of changes.

Gravity which has been staring us in the face for so long has gained in importance in correspondence to its magnitude, and only in this respect does it resemble the aether plenum, which is now passing out of Physics, Gravity before this was a waste, which had no existence apart from Mass. Now we are able to view Gravity not only as the source of energy, but as the primordial units co-ordinated into systems, termed Matter or Substance: and of greater consequence we have reached a stage from

keeping if necessary, Time and Space ahead of us and never catching them up. But this has not been necessary in viewing Consciousness as a passivity divorced from mentality.

This theory wants to work on the basis that a thing is and is not from moment to moment, and just as we have established a unit Volume and a definite form of each unit of substance, so have we reached a unit of Time, which can be a moment of *is*, or a moment of *is-not*. Repetitions, the nature of intersistence, entail consciousness of continuity. But continuity like motion is an illusion for there is no curve in the reality and a line is but broken quantum stitched together. A point has only become a mental possibility in that a unit volume is and is not from moment to moment. In short nothing is definite in the universe except reciprocal intersistence, but as this cannot be extended by co-ordination into a system, we are only conscious of variability. The more delicate a balance is or a pendulum is constructed the greater the ineptitude to quiescence. An error of experiment is virtually a *sine qua non*. Absolute truth is undeterminable as long as the intersistency of thought fails to correspond; hence the uniqueness of the elementary mathematical processes, where there is correspondence. The Reality has been hidden from us for so long, which philosophers have classed as unknowable for these reasons and these alone. Recognize the basic principle of intersistence and the universe is comprehensible. A Judge deems a case proved by evidence in correspondence: Prevarications are never healthy, and a soul of truth elicited therefrom never has the same force of conclusiveness attached to it as that derived from a mass of correspondences. Truth like a bud is healthier if not forced, and no one can aver that the elaborations of this theory are strained. Scientific Conventionalities have been ignored in all elaborations, and the freedom of common sense has thus steered our subject to this conclusion.

which we can view Gravity as the Director of Evolution in the ordination and uniformity of changes. If there were no gravitational field astronomers would have no direction, and chemists would fail without a constancy in weight; in like manner the tree would have no proclivity to elevate itself, nor would molecular crystallisation be possible. In fact its elimination would mean chaos. Its presence removes design from the Reality.

Thus it is not necessary to have the Guiding Hand projected into the Universe, in that we can see, possibly dimly at present, that Gravity with its reputed constancy is going to keep its own house in order.

APPENDIX.

The Ego.

In the chapter on Life on page 203 a confession is worded, "that there may appear confusion to the reader I fully recognize; and on this issue the theory might be condemned; but it can only be condemned because we are not in a position to create the Universe ourselves, and thus keep Individuality and Free-will outside it, taking away all reality and converting the whole business into Idealism."

As I suspected it;—an account of the constitution of the Universe without deeper reference to the controversial subject of consciousness could not be closed. I had, however, hoped an acceptance of an Ultra-reality as a *sine qua non* was sufficient for establishment of this theory, and its unknowable, though inferred, nature would not require discussion; but the subject of Life has convinced me, clarity is sacrificed by the omission.

Feeling that this my first attempt probably may be my last essay to indulge freely in a subject, the goal of science, which seemingly will reconcile Science and Philosophy, though the "Concluding Remarks" have gone to the press, I purpose to insert this digression that it may placate those readers who consider a discussion on the ultra-realism cannot be omitted from a work of this nature.

Be an ontological theory a possible scientific concept or a liberty provided by the generosity of Philosophy, this theory in maintaining the absolute indivisibility of the unit can claim no position in either of those two realms: yet, for the want of a better description, this theory is ontological. We have refused to traffic in continuity, and having contrasted consciousness with mental activity, creation and annihilation (the Is and the Is-not) had given us sanction to deal with the philosophical trinity of the unconditioned, the absolute, and the infinite as realities; therefore cognizable. This new departure it must be admitted requires explanation; and the difficulty is, how to do this within the normal limits of a chapter.

Everybody who has dealt in metaphysical speculations inwardly feels there is much that cannot be expressed. Hence a critic of any philosophical system in dealing with isolated statements is virtually taking an unfair advantage of the exposition, and judgment should be withheld until that the unexpressed portion can be supplied. It is, therefore, not my intention to fall into this error. But so far as the saving of time and lucidity is concerned it is essential that quotations must be put into use. As a guide to the reader, I should mention that I have adopted the philosophical teachings of Herbert Spencer as a framework of reference, and have endeavoured to adhere to his nomenclature as well.

Hume with his "impressions and ideas" had not our later knowledge of the nervous system, hence his division of the subjective world and objective world was not well founded. The feeling was then, that the faint impressions on consciousness differed in genesis entirely from the vivid impressions. Objects as vivid visual impressions lay outside, away and separated from the perceiving subject; sounds behaved the same; smells could suggest their outlying sources; the direction from which heat radiated was ascertainable; taste lay in the mouth, as the sense of touch lay in the skin; internal sensations with more indefiniteness could yet be localized. Thus cognition of the objective world grew fainter as the spatial realms of the subjective world were invaded. In short this was an indirect way of locating Consciousness. Thoughts, emotions, will and so forth having no proper allocation were therefore deemed to be part of the subjective world. Faintness became confused with this indefinite localisation, and Hume called such Ideas.

It is needless to state, that the present tendency is to correlate all mental manifestations with neural changes. Be it apparition or vision, both are caused or are dependent on the nervous system. No matter what light is before it enters the eye, the sensation of sight is thereby produced by direct affectation of the specialized part of the nervous system. And this applies to all sensations

producing cognition of a world distinct from the subject of consciousness. Therefore as we have a nervous system, which in its metabolism or metamorphism, produced by outside influences, can render cognition possible, we are bound to believe that, what for the time being may be called, spontaneous metabolism produces cognition of those things, termed ideas. If so then the recognition of such as being a part of the subjective world is incorrect. The Ego in this way is no longer the sum total of its ideas, as Hume puts it. The Ego under these circumstances must be something entirely different to a congeneries of evanescent things. And this is what common sense tells us, that the Ego is an unchangeable equilibrium of something.

Herbert Spencer's difficulty arises the moment consciousness is recognised as an activity, which brings the Ego under spatial and temporal conditions; and as will be seen later on really entails the Ego possessing substance. He develops consciousness apparently from nothing *pari passu* with the development of the nervous system. For he says, that if the changes that produce consciousness occur at random, properly speaking there is no consciousness; meaning that there must be a power to co-ordinate the successive changes to produce true consciousness. And we add parenthetically, Power connotes activity;

This necessarily brings in the recognition of causation, entirely dependent on temporal factors, which appears to have no connection with the Ego. For the Ego, as said before, appears as an unchangeable equilibrium of something, the nature of which cannot even be inferred, though its passivity is evident. To speak of anything having existence outside space, time and substance is impossible unless we unite those three realities into one, and place this besides something else in symbolic form. The axle of a rotating disc does or does not rotate with the disc. If it does we have a top, and if it does not we have the wheel and axle. In the latter case we have the Ego represented by the axle; and as the

Ego is conditioned, the objective world has to conform, but only under definite conditions. Alteration of the plane of the disc affects the line of the axle and there is no resistance ; but alter the line of the axle, the disc offers resistance. Thus there may be no adhesion between the Ego (axle) and the objective world (disc). The latter can influence the former without resistance, whereas the former, the Ego, is unable to alter the plane of the disc, or (strictly speaking) the changes in the objective world without resistance being experienced.

We can view the Ego as we have done before as a person standing before a looking glass gazing at the image that appears separated from the person spatially considered. The recognition of the image of self can represent that state which offers infinite repetition of consciousness. The Ego put in this way is conscious of its consciousness. The reflection of light to and fro as a succession of repetitions infinitely extendable is conceivable, and thus is comparable to that inexplicable fact or feeling, that the Ego not only recognises being conscious of an objective world, but also maintains that it recognises itself as being conscious.

Assuming that any alteration in appearance of an image of reflection can only be produced by alteration of the substance or form of the reflector, we are able to understand how, although the Ego is an unchangeable equilibrium of something, in the objective world it is apparently changing in mental activity without change or loss of identity. With this view it is possible to see how the Ego is an ultra-reality beyond space, time and substance. And this can be tested by observing the impossibility of locating the Ego in any part of the objective human body with all its physiological systems. No matter what the vicissitudes of life may be, the Ego undergoes no alteration. No matter what a person thinks or feels, he remains the same person. Nobody has as yet been able to realise a beginning of its existence or suspect a spiritual death ; hence the intuitive feeling that Time is no governing condition of identity of self. Both these

facts tend to conclusively prove the existence of Ego is of a different nature to the existence of anything in the Universe as constituted with the realities Space, Time and Substance. In fact the word "existence" with its connotation is inappropriate. As the image behaves to the observer, so the observer is conscious of, what is ordinarily accepted, alterations in Self. That the image cannot reach or influence the observer is a fact, just as our mental activities cannot influence our identity. A state of consciousness is merely the impression of the image. We admit the image is, so far as the reflector (the Universe) is concerned, changing in appearance to the observer, the Ego; but we maintain the observer remains stolidly the same. This means, if there is no change there is no time; and there being no change there is no form, and therefore no space or substance in our newly laid out subjective world. In other words the Ego cannot be described as a physical existence.

The illustration, therefore, so far has not played us false.

In one sense then Idealism is correct. Judged from the ultra-reality position of the Ego, the image is all that is seen and no reflector is recognised or inferred. But in another sense it is wrong. Judging from the illustration, it is a fact that there is, nay must be, a reflector (the objective world) to produce the image of reflection, which can be termed the objective self. Realism errs in identifying consciousness with mental activity. In other words it confuses the image with the observer, although it recognises the existence of a reflector (the objective world). Judging from this illustration, there is no wonder that the exponents of both systems have never been able to reconcile each other,

If we now turn to Herbert Spencer, it is to be noted that without vicarious judgment on this matter no headway can be made. Physically considered with him the Ego is the entire organism, the nature of which is predetermined. He then closes his chapter on the Will with these statements, "The aggregate of feelings and ideas

constituting the mental *I*, have not in themselves the principle of cohesion holding them together as a whole; but the *I*, which continually survives as the subject of these changes states, is that portion of the Unknowable Power which is statically conditioned in special nervous structures pervaded by a dynamically-conditioned portion of the Unknowable Power called energy." Before discussing this, it can be incidentally mentioned that Herbert Spencer does not recognise that matter and energy are of the same substance, as we have consistently done throughout the elaboration of this theory.

We have it therefore clearly set out by an eminent thinker, that there are two Egoes; and by one who would identify Consciousness with Thought, or as we put it, with Mental Activity.

And I think it is in the latter case where Herbert Spencer and probably many others err. Consciousness is not Thought by any means. We are conscious of our so-called mental feelings, or as we have put it, our mental activity impress on Consciousness. If the reader puts the question to himself or herself, "What am I conscious of?"; the reply can but be, "I am conscious of much and that in this massive impression, I am conscious of things remembered." There is a vast difference in saying the mind remembers, and that there is a consciousness a thing remembered. Possibly for this unexpressed reason Herbert Spencer reaches the astounding previously mentioned result, that there are two (Egoes,) which he is continually denying.

Strictly speaking the subject cannot be discussed. This not only absorbs Time, but adumbrates a curious power of being conscious of our consciousness as existing. In therefore saying I am conscious of this or that, such is really stating a past consciousness in present terms: which is absurd. If I state that I was just a moment previously conscious of this or that; then consciousness appears as endowed with memory, which is an assumption the reality of which the sought-for premiss is to prove. Along with this we have the Ego persisting as it were unchanged.

By the aid of the reflection illustration it can be seen what is meant by *consciousness of no duration*. The Ego is, as it were, viewing a picture painted in Space. Time Substance ; i.e., all the extension and change in sequence of substance form no part of the conscious self. In this way the subject is unconditioned, absolute and infinite. It is unconditioned, in that the Ego refuses to be treated quantitatively ; it is absolute in that it has no qualities ; and it is infinite in that it is conscious of infinity as well as zero. Except in illustrations we can bring nothing forward to make others conceive an ultra-reality or a something unconditioned, absolute and infinite. The mind has only the Universe constituted of substance conditioned in Space and Time to play about with. It has no absolute quantity because it has infinity and zero on either side. And finally it has nothing infinite, because everything for the mind is finited. On top of this we have the mind contemplating the consciousness of the Ego, and the Ego conscious of the mental activity ; under which of course we include the vivid impressions, of philosophical nomenclature.

Whereas Herbert Spencer recognizes the Ego in duality as substantial and mental, under the above view as set out above, we must recognize three Egoes. And if we are allowed to merge one into the other and therefore quantitatively estimate each, it will be found that in this we have a correspondence in Life. The lowest forms of life according to this theory will develop the minimum amount of vital units, which can be virtually put at zero. The substantial or our third Ego with these low forms is at a maximum : That is the gravity or primordial units react on the architecture directly, practically without any transformation into vital units. Hence practically nothing is mentally impressed, producing therefore little or no mental activity, which in turn tends to reduce the impress on consciousness to nil. Instinct is here in its highest form or most intense mood, which can be described as simple reflex action.* At the other end of the living scale,

* Note :—Reflex action is not generally recognised as instinct.

as with man, we get a maximum exhibition of consciousness, an increased mental activity with a weak appearance of instinct corresponding with an increased transformation of gravity into vital units. All grades will lie between the two extremes.

It is not the purpose of this chapter to shew that such indicates there are three types of corresponding vital units, for the object has been to explain how we must conceive the conscious Ego at the one end, as unconditioned, absolute and infinite, and the substantial Ego at the other end, as conditioned in space, time and in substance, correlated and finite in system as a primordial organism is. The reader at this juncture, however, should bear in mind that existence of vital units in a system can only constitute a living thing, provided gravity is continually being transformed into such. With these assumptions there should be little difficulty in seeing a correspondence in vitality and this three-fold Ego.

An analysis of the vexed question of a Criterion will endorse this postulated difference between Consciousness, Mental-activity and Instinct.

No amount of thinking tells us how the consciousness of space, time and substance is founded. Even Herbert Spencer's universal postulate of the inconceivability of a negation cannot help us here. The reason is, that this postulate is a mental activity, and consciousness is not, but stands on a higher level. Therefore, of what one is conscious cannot be disputed, or put in the words of the author, we have so often quoted, "the fundamental intuitions that are essential to the process of thinking, must be temporarily accepted as unquestionable": Parenthetically this we would alter into *permanently*.

Consciousness classifies mental activity. If we could not be conscious of quantity, similarity, dissimilarity, causation and so forth no matter how much mental activity is impressed on the consciousness the catenation will be chaos. The coherent mental activity and even the instinctive actions of a lunatic, failing a normal consciousness, point rather clearly to an ascendant second

Ego and a declining first, or conscious Ego. Reasoning is not infallible, and apparently these acts can go on without impress of consciousness; but as soon as they are submitted, there is a higher power than mind, that certifies to their correctness or distrustworthiness. If I am conscious the sky is blue, it is blue; nobody can mentally convince me it is green. I cannot conceive a negation of its blueness; for I would be liar. Herbert Spencer in stating "to be conscious is to think," to my mind is incorrect. I am conscious that a whole is greater than a part: I do not think this out; I know it. If a man cannot distinguish between good and evil, reasoning is powerless to force on him a conviction either way. If I am conscious that $2=2$, no amount of algebra will convince me $2=3$. The judgment is that algebra is faulty. Hence algebraical computations cannot initiate a conception. If I am not conscious of a certain thing I can be convinced by the impress of mental activity, but reasoning is powerless in destroying any state or impress of consciousness.

Consciousness apparently is infinitely impressionable; and being, as it were, the store-house of abstractions or intuitions, mental submissions somehow or other are erroneously credited with conceptions. A faulty mind has only induced seemingly erroneous conception through its untrustworthiness during impress of consciousness. Hence the Ego is conscious at times of things that have no reality. Man sees beauty, utility and so forth, as biologists see a purpose in reproduction, through the way in which things have been presented to the conscious Ego. In the reality these abstractions and purposes do not exist. But the mind can never be credited with having produced the same.

In concluding this chapter, which has been hurriedly written, I trust the reader can see that the exposition is a form of Realism which is reconcilable with Idealism. Further that the recognition of an ultra real Ego is a set off against the ultra-real power behind the Design or the nature of the evolution of this Universe. With these

two ultra-realities, clearly the Universe composed of the three realities, Space, Time and Substance, becomes the third component in the Ultra-reality. Therefore if the Conscious Ego contains the Infinite Universe, figuratively speaking it must meet the most active component, which is the Power behind the scenes. If so, it is intelligible by inference, that if the Ego (subjective world) with its passive nature knows the Universe (objective world) of greater activity, it is highly probable it can be directly conscious of the Supreme Power of the greatest activity. This is Religion. So we are now in a position to start about the reconciliation of those three disputants, Science, Philosophy and Religion. But that is another subject.

(ref)=referred to.

Appearance : *state* of (temporal), 46.

Index.

- Architecture** : as a transformer of energy, 131 ; (mean), 98 ; and *mental activity*, 252.
- Arithmetic and Algebra** (comp), 6.
- A-Sexuality**, 224.
- Astronomical** : *cohesion*, 112 ; *direction*, 245 ; *questions* (disc), 214 ;
- Atmospheric electricity**, 119 ; *pressure and gravity*, 87.
- Atom**. The *unsynthesized*, 28.
- Atomic** : *cohesion*, 95 ; *vibration*, 61.
- Atomic energy** : and *heat*, 53 ; *internal*, 69.
- Atomic weight** : and deflected *gravity*, 230 ; (ref), 32 ;
- Atomicity** (ref :), 27.
- Atmospheric electricity**, 119 ; *pressure and gravity*, 87.
- Attraction** : *anomalous electrical*, 166 ; *electrical* (expl) ; 167.
- Axiom**. of *motion*, 6, 10 ; of *occupied space*, 13 ; The, ix.
- Balance** : The *criterion*, ii ; of *equality*, xv ;
- Balance** : *experiments* with a, 227 ; a *rotating*, 229 ; a *top-heavy*, 238.
- Balances** : *variability* of, 211.
- Balloon** : behaviour of the *enclosed gas*, 87 ;
- Biology** : *continuity* in, 202 ; and *evolution*, 9 ; and *physics*, 209 ; the *science* of, i, 4 ; and *spontaneous generation*, 225.
- Birth**, *conditions* on, 210.
- Bismuth and dia-magnetism**, 179.
- Black-drop**, The, 234.
- Blackness** : (def), 157.
- Bose** : (ref), 193.
- Boyle's Law** : (ref), 49.
- Brittleness** : (expl), 106 ; (ref), 87.
- Brownian movements** : and *life*, 208 ; (ref), 51.
- Caloric equivalents**, 98.
- Candle** : *electrical experiments* with a, 165.
- Catalytic action** : not explained, 68 ; of *life*, 195.
- Cause** : (disc), xiv, 17 ; and the *Ego*, 248.
- Celestial bodies** : *growth* of, 216 ; absence of *opaque* (cold), 214 ;
- Centre of Gravity** : 117, 243.
- Change** : (mean), 189.
- Chaos** : in a *gas*, 84 ; (ref) ii, and the *Universe*, 113 ; and the *units*, 28.
- Chemical energy** : (disp) 105, 133, 171 ; (ref), 68.
- Chemical experiments**, (disc), 211.
- Chemical properties**, 4.
- Chemical Union** : and *cohesion*, 99 ; *nature* of, 215 ; and *reproduction*, 225.
- Chemistry** : and *physics*, 105 ; the *science* of, i, 4.
- Circle and inscribable figures**, xiv.
- Chlorine** : The *origin* of, 211.
- Chlorophyll** : its *action*, 208.
- Clouds** : *suspension* of, 134.
- Coal formations and energy**, 212.

Index.

- Coalescence under action at a distance**, 113.
Co-extension and perception, 198.
Coherence of particles, 97.
Cohesion: (chapter on), 93; *electrical*, 54; and *electricity*, 95; *intensity* of, 94; and *molecular activity*, 86; (ref), 75; the *state* of, 33.
Colloidal state, (ref), 37.
Colours: *intensity of light* in, 156; *nature* of, 149, 150.
Comb: *diffraction* experiments with, 238.
Common Sense, 21.
Compressability, 97.
Conception: *forming a*, 6; *power of a*, 21; of *space and time*, 72;
Condenser: *electrical*, (*behaviour* of), 169.
Conduction: *electronic* 66.
Consciousness: *allocation* of, 247; (def), i; (disc), iii; of *no duration* 287; *impress on*, ii, 203; and *life*, 252; the *nature* of, 203; as a *passivity*, 194; of *responsive power* and *Will* 191; *scope* of, 15; *suppression* of, iv; and the *ultra-reality*, 195; and the *Universe*, iv, 287; and *vital units*, 252.
Conservation of Energy: (disp), 133; as *finite* (the *rise* of), 71; an *incongruity* of, 109; and *intersistence*, 9; (ref), 22.
Consistency in the production of motion, 85, 157, 174, 175.
Constellations: *coalescence* of, 113; *dynamical equilibrium* of 54; *growth* of, 216.
Contact: *electrical*, 131, 161; and *intersistence*, 10; *mutual*, 37 and; *pressure*, 97.
Contact-electricity proving intersistence, 10.
Continuity: *biological*, 202; in *motion*, xv; (ref), 243.
Continuums (disp), 41.
Contraction in chemical action, 215.
Convection, (ref), 63.
Convergence of the gravitational field, 117, 121.
Co-ordination: (chapter on) 35; in a *fluid*, 91; in a *gas*, 89; *interference* of, 39, 97; in a *solid*, 91; *sphere* of, (disc), 33, 36; *stability* of, 99; the *three types* of, 38; of *units*, 79.
Corpuscular emission theory of light, 146.
Cosmic matter: *non-coalescence* of, 135.
Creation and addition, 1; *nature* of, 42; *special*, (ref), 242, 244.
Creator: (ref), 209; *The*, 205; *unpersonified*, 238.
Criterion: of *phases* of *intersistence*, 46; *The*, 253; of *unconsciousness*, 191; of *work done*, 77.
Critical pressure, 90.
Crystals: *growth* of, 219; and *life*, 225.
Crystallization: and *absorption of gravity*, 231; *heat* of, 135.
Cube: (ref), 26-32; compared to a *sphere*, 2.
Currents (electrical): *direction* of 165; and *gravity*, 230; *opposed*, 161; *velocities* of, 164, of different *polarity*, 160;
Darwin's Theory, 217.
Death of various organs, 138; (expl), 237.

Index.

- Definition :** (meaning); of *architecture*, 98; of *blackness* 157; of the science of *Cohesion*, 105; of *de-electrification*, 161; of *dense matter*, 209; of a *dense unit*, 158; of *diagonal width*, 35; of *diffused light*, of the *Ego* 248; of *electrical dualism*, 169; of *electrical turbulence*, 173; of *energy*, vi; of *force*, viii, 71; of *force in action*, 78; of *inertia*, viii, 78; of a *nucleus*, 100; of *persistence*, 22; of *spacial matter*, vi, 13, 19; of *substance*, vi; of a *system*, 80, 93; of *temperature*, 90; of *transformation of energy*, 164; of an *un-electrified body*, 164; of an *increase of velocity*, 155; of *work done*, viii.
- Deflation and division**, 2.
- Deflection :** of a *satellite*, 112; of *gravity*, 117.
- Dense matter :** (def), 209;
- Dense Unit :** *frequency* of, 37, 45; and *kinetic energy*, 139;
- Design :** a *condition* of the, 43; (disc), x, 118, 223; as *evolution*, 220; the *foci* of appearances in the, 211; and *life*, 189; and the *mechanic*, 220; and the *phases*, 41; (ref), 100.
- Desire and Will**, 204.
- Determinants in evolution**, 224.
- Diagonal Width :** (mean), 35.
- Dia-magnetism** (expl), 179.
- Diamond**, its *position* in nature, 219.
- Dielectric** (ref), 162, 171; and *strain*, 164.
- Diffused light**, 141.
- Diffusion :** (disc), 64; of *gases*, 90; and *heat*, 90.
- Diffraction of light**, 157, 233.
- Dimensions :** the *three*, 16.
- Discreteness :** (ref), 16.
- Diseases caused mentally**, 200.
- Dissipation :** of *motion*, 218; and *cohesion*, 100; of *heat*, 248.
- Dissolution and evolution**, 218.
- Division :** as a *part*, 1; (ref), xv.
- Doppler's Effect :** with *emissions* or *waves* (disc), 185; with *light* and *sound* (disc), 152; (ref), 155.
- Double Polarization** or *disappearance* of light, 169;
- Double Refraction**, 153.
- Dreams :** the *nature* of, 190, 198.
- Dualism in electricity**, 165, 168,
- Dulong and Petit's Law**, 49.
- Dust :** *adhesion* of, 134, 167.
- Dynamical Equilibrium :** of an *atom*, 95; of a *molecule*, 96; (ref), 54. *sphere*, 61.
- Dynamics :** as *knowledge*, iv; *probabilities* in, 63.
- Earth, constituents** of the, 215.
- Echo, perception** of an, 199.
- Effect :** (disc), 17.
- Eggs :** *hatching* (as *absorbers of gravity*, 231.
- Ego :** (chapter on), 246; and *Herbert Spencer*, 248, 251; and *mental activity*, 253; The, (ref), 205; The, (as an *ultra-reality*), 249; The, (as an *unchangeable equilibrium*), 248.

Index.

- Egoes.** *The three*, 252.
Einstein: see (Relativity).
Elastic film: (disc), 51.
Elasticity: (disc), 64, 84; (expl), 103; and *fatigue*, 104; and *life*, 192.
Electrical Polarity: *attraction and repulsion*, 58, 166, 168; and *conduction*, (ref), 59; and *the earth*, 160; *fatigue*, 162; an *illustration* of electrical charges, 167; *interpreted*, 161; *motion in*, 173; *neutralization*, 59; and *potentialism*, 56, 165; (ref), 55, 165; and *turbulency*, 170, 172.
Electric Currents: see (Currents), 160, 164, 165, 230, described, 161; (disc), 56, 58, 66; *dual nature of*, 163.
Electricity: (Chapter on), 159; of *the atmosphere*, 119; *Contact*, 181, 161; *frictional*, 57; *the nature of*, 56; (ref), 130.
Electrolytic Action: (disc), 65.
Electro-Magnetic Theory. The: (ref) 7, 33, 60, 73, 176.
Electron: The, (ref), 58, 130.
Electronic Theory. The: and *cohesion*, 95; and *conservation of energy*, 23; (disc), 54; and *the emissions*, 68; *the vaporization constant*, 98.
Electrostatic charges: (expl), 164; *conditions of*, 231; and *currents*, 160; *experiments*, 166, 170.
Elements: *the alkaline*, 230; *genesis of some*, 212, 214.
Emanations: *luminous*, 145;
Embryo: *the development of the*, 138.
Emission Theory. The: *electronic*, 68; (ref), x; *supported*, 154;
Emotions, *the nature of* 204, 254.
Empyricism: *examples of*, 49; *the nature of*, 60.
Equilibrium: *dynamical*, 54; *mobile*, 189.
Energy: and *action at a distance*, 109; *chemical* (disp), 183, 171; (ref) 68, 105; in *coal*, 212; *conservation of*, 22, 71, 109; (def), vi; absorbed in *diffusion*, 64; and *electricity*, 183; *excess of* (in experiments), 181; of a *gravitational field*, 73; 119, 119, 188; *kinetic* (ref), 73; and *life*, iii; *location of*, 108; (of *magnetisation*, 176;) and *matter* (compared) vii; 6, 143, 240; and *matter* (identified), 56; *modern ideas of*, iii; *molecular transmission of*, 152; of *the muscles*, 208; *the nature of*, 143; of *the nerves*, 196; *perception of*, 129; *potential*, (disc) 71, 193, (disp) 190, (ref), 108; *Radiating*, (chapter on), 141; of *radio-activity*, 67, 119; *rectilinear forms of*, 46; of *rotation*, 76; of *sound*, 185; of *the Sun*, 108; *transformation of* (chapter on) 129, (ref) ix 242; *tubes of* (disp), 181; as *single units*, vii; of *waves*, 104.
Ethics: (ref), 200.
Evolution: (chapter on) 217; based on *cohesion*, 223; *director of*, 220, 245; of *the elements*, 214; and *gravity*, 223; as a *simple process*, 224.
Exercise: *physical*, 232.
Expansion: by *heat and gravity*, 90; in *chemical action*, 215.
Experiments: see (Predictions, 227); *aeronautical*, 134; *errors in*, 244; with *gravitation*, 126; *magnetic*, 176.
Explosions: *atomic*, 67; (ref), 68, 105.
Eyes. The, and *mental activity*, 199.
Fatigue: *elastic*, 104; *electrical*, 162; *electrostatical*, 170.
Feelings: *conflict of*, 200.

Index.

Figures see (forms, 25.)

Finiteness : as a *discreteness*, 41; *discrimination* of, 42; and the *diverse manifestations*, xi; and *matter*, xii, 22, 122; (ref), 243; of *space* (when permissible), 25.

Finitum. (boundless). 5, 6, 243; *recognition* of a, 15;

Flat-land business, iv, 15.

Fluidal "rigidity", 105;

Fluidity : *analysed*, 80; *described*, 88.

Flying : *detection of inverted*, 167.

Foci of packing, 211.

Food : *energy in*, (denied), 206, 208.

Force : *in action*, viii; as *bombardments*, 86; (chapter on) 70; *concentration* of, 81; *distribution* of, 79; (def) viii, 71; as *insistence or will*, 72; as a *line*, 219; *lines* of, 60; *modern idea* of, 72; as a *point*, 28; as a *quantum*, 79; *tubes* of, 60.

Form : (chapter on) 25; *constancy* of, 26; *rectilinear*, xiv, 25, 26;

Four dimensions : ii, 20, 23, 46.

Franklin's electrostatic experiment, 162.

Free-will : The, 187.

Frequency in *intersistence*, vi, (dense units), 45; of *light waves* and *intersistence*, 146.

Frog's heart (ref) 138, 208.

Fundamentals. (chapter on), 13.

Future Time. The; iii, 16; and *zero*, 3.

Galvanic Battery : 165; compared to *dielectrics*, 171; as a *system*, 94.

Galvanometer. The, 159.

Gas : as *molecules*, 86; under *restriction*, 88; *viscosity* of a, 89.

Gas Inclusion : *Heat* of, 135.

Gasping in falling, 87.

Gear Wheels and *cohesion*, 100, 105.

Generation of life, 225.

Geological evidence of life, 226.

Geometry as *knowledge*, iv.

Glass and *paraffin* as *dielectrics*, 162.

Gold. *cohesion* of, 95.

Gravity : (chapter on), 107; *absorption* of, 127; *anomalous*, 110, 125; *annihilation* of, 127; *convergent*, 117; *deflected*, 117, 170, 172; (normal) *deflection* of, 137; and *Einstein*, 72; and *elasticity*, 104; and an *electric current*, 230; and *electrification*, 231; *enhanced* by light, 229; as *energy*, 92; and *evolution*, 221; at *grazing distance*, 167, 173; and *growth*, 193; *harnessing*, 132; and *induction*, 100; *interference* by, 116; and *life*, 207; and *magnetism*, 110, 178; *nature* of, 118; the *pushing idea* of, 111; and *radio-activity*, 132; *reproduced*, 139, (ref), vii; and *specific heat*, 230; *transformation* of 118, 129; *variability* of, 108.

Gravitational Field : (disc), 125; *elimination* of the, 39; *energy* of a, 73, 129 A, (limited in extent), 126; *magnitude* of a, 133; *problems* of a, 109.

Gravity units, *phase* of, 45.

Grazing distance effects of gravity, 167, 173.

Index.

- Grazing distances:** in *capillarity*, 49; of *gravity*, 107; of *light* in diffraction, 157, 234.
- Habitations** *health* of, (and *gravity*), 232.
- Hall, and gravity**, 126, 231.
- Halogon Elements:** and *Life*, 213.
- Hallucinations:** 197.
- Hardness:** (expl), 106; (ref), 37.
- Heat:** of *capillarity*, 135; of *combustion*, 133; of *compression*, 183; of *crystallisation*, 135; of *diffusion*, 90; of *electric currents*, (expl), 169; and *gravity*, 133; of *included gases*, 135; modern *incongruous ideas* of 52; *interference* of 39; and *magnetism*, 178; as *matter*, 86; *molecular*, 158; and *molecular activity*, 85; and *pressure*, 85; *potentialism*, 57; *radiating nature* of, 164; *surface tension* and 51; and the *vital units*, 193; *varieties* of 155.
- Helium** (alpha rays); *penetration* of, 106, 131; (ref), vii 28.
- Herbert Spencer:** and *evolution*, 212; and *finality*, 219; and *nervous force*, 196, 147; and *thought*, 253.
- Heredity:** (disp), 209; and *Weismann*, 217.
- Hertzian Waves:** as *emissions*, 184; and *induction*, 143, 184.
- Hexagon:** in a *circle*, xiv the *nature* of a 25.
- Hume:** his *philosophy* (ref), 247.
- Hydration** of *ions*, 66.
- Hydrogen:** *source* of 211.
- Hydrostatic:** The, *paradox*, 83; *pressure* and *gravity*, 88.
- Idealism:** xi, 203, 250.
- Illumination** and *self-luminosity*, 144.
- Illusions:** (ref), 10.
- Illustrations:** see (analogous illustrations).
- Imagination** and *memory*, iii.
- Imitation:** a *basic instance* of, 218; the *nature* of, 81; in *Nature*, 217 see (*Repetitions*).
- Impress of Consciousness**, 203.
- Impressions** and *ideas*, 247.
- Imponderable matter**, 211.
- Incandescence:** *light* in, 133; (ref), 230.
- Incident** and *refracted light*, 152; and *reflected light*, 153.
- Indestructability of matter:** (disp), 28, 210; (ref), 22.
- Induction:** (chapter on) 180; (expl), 181; and *gravity*, 180; and *hertzian waves*, 184; and *luminosity*, 181; in *magnetisms*, 182; *sluggishness* of electrical, 170.
- Inertia:** as *cohesion*, 94, 97; (def), viii, 78; (disc), 70, 72; as *repetitions*, 222.
- Infinite:** *Consciousness* as, ii; The, *Ego*, 252; The, and the *inconceivable great*, 238; *space* as, 6.
- Inflation** as *multiplication*, 2.
- Insects:** *activity* of, 208.
- Insensible conversions**, 8, 70.
- Insistance:** as *force*, viii, 72; of *gravity units*, 114; *transmission* of, 81; and *will*, ix.
- Instability of top**, 44; (expl), 35.

Index.

- Instantaneity** : of *induction*, 180 ; in *intersistence*, 42 ; of *phases*, 41.
Instinct : (rei), 200 ; *repression* of, 201, 252.
Integration of matter, 218.
Intelligence and Sexuality, 201.
Interference : by *gravity*, 116 ; in *intersistence*, viii, *production* of, 45.
Intersistence : *conception* of, 242 ; how *derived*, 18 ; and *disintegration*, 102 ; (expi), v ; *formulae* of 43 ; and *instantaneity*, 42 ; *interference* of 79 ; *loci* of 37 ; and *motion*, 9 ; *nature* of, 42 ; *phases* of, 23 ; *reciprocal*, 93, 174, 218 ; *temporal aspect* of, 38 ; of *gaseous units*, 91.
Intro-convertibility of figures, 30.
Intuition. The, of the *opposite*, 17.
Intuitions. The, 254.
Inverse Square Rule, 120.
Ionisation : (disc), 59, 66, 171 ; and *electric currents*, 165 ; *incongruities*, 67.
Ions : (ref), 65.
"Is and Is-not". The, 246 ; in *mind*, 18 ; in *motion*, 10 ;
Isomeric action in nerves, 192.
Isotope. The, (ref), 28.

Joule's determinations (equivalents and a gravitational field,) 136
Jupiter in the nebular theory, 215.

Kepler : (ref), 125.
Kinetic molecular Theory : *defects* of, 50 ; (disc), 83, 103 ; and *gravity*, 83, 89, 91.
Kinetics as knowledge, iv.
Knowledge (disc), iv, 237.
Kolar pendulum Experiments, 120.

Laplace's theory of Capillarity ; (disp), 51 ; (ref), 49, 65.
Latent Heat and gravity, 137.
Laws numerical, 25.
Lenox Conyngham and gravity, 120.
Leyden Jar. The. 162 ; and *magnetism*, 163.
Life : (chapter on), 187 ; *absorption* of *gravity*, 205 ; and *Brownian movements* 208 ; *conditions* for, 253 ; and *consciousness*, 252 ; and the *Design*, 189 ; and *elasticity*, 192 ; as a transformer of *gravity*, 207 ; and *gravity*, 187 ; *growth* in, 138, 193 ; and *osmosis*, 192 ; the *purpose* of (disp), 204 ; the *reality* of, i ; and the *sciences*, i ; the *secret* of, 200.
Light : the *behaviour* of 152 ; the *colours* of, 150 ; *continuity* of, (expi), 144 ; *corpuscular nature* of, 233 ; *deflection* of, 234 ; *diffraction* of, 157 ; *diffused*, (disc), 141 ; *enhancing gravity*, 229 ; *force* required to *refract*, 93 ; and *gravity*, 133 ; at *grazing distance*, 158 ; *incandescence*, 280 ; compared with *electrical induction*, 181 ; and *instantaneity* 143 ; *intensity* of, 149, 150, 151, 185 ; as *luminosity*, 145, 158 ; *measurements* of *light*, 146 ; *nature* of, 144 ; *perception* of, 142, 194, 199 ; *polarized*, 146, 151, 153, 169 ; *potentialism* of, 57 ; *production* of, 135 ; *reflection* and *self-luminosity*, 145 ; *refrangibility* of, 149 ; and its *transmission* of, (expi), 144, 150 ; *transverse waves*, 147 ; *undulations* of, 146 ; the *nature* of *white*, 154.

Index.

Line: (ref), xiv.

Line of progression: of a *gravity units*, 120; (ref), 100.

Liquefaction: (ref), 61.

Liquidity: (ref), 97; *state* of 66.

Lizard's Tail, 138.

Loci: *distances* of (considered), 46; of the *electric units*, 186; *examples* of, 45; of *herztian waves*, 184; cf *intersistence*, 57; of *light units*, 148; of *magnetic units*, 186; of *re-appearance*, 41, 184, and *identity*, 143; *The Three*, 37; of *units*, 122;

Longevity: (ref), 232.

Lubrication: (ref), 139.

Magnetic: *induction*, 182; *mass*, (ref), 111; *storms*, 119; *strain* 178.

Magnetisation: *production* of 178.

Magnetism: (chapter on) 175; and *gravity*, 110, 138; and *heat*, 178; the *modern idea* of, 59, 175; and *strain* 178.

Magneton, 59, 86.

Majorana's absorption of gravity, 128, 228.

Manifestation: the *reality* of a, vii; of the *state* of *Rest*, 117;

Mass: as *variable*, 92;

Mass Action: in *gases*, 64.

Mass Attraction: *action* on *gas molecules*, 64, 84, 92.

Matter: (def) vi; and *energy* (identified) 6, 56, 240; *finite*, 122; *imponderable*, 211, *indestructibility* of, 22, 23; as *integrated*, 218; *states* of, 86-89 the *three states* of, xv; as a *multiple unit*, vii.

Matter (spacial): *additions* of, 77; (mean), 13; *described*, 19; as *gravit* 114.

Materialism: 237; see (*Realism and Idealism*).

Mathematical Processes. (Chapter on), 1.

Mechanical Construction and the *Design*, 220.

Medical Science: and *death*, 138.

Medicine: 231.

Medium of absorption of *gravity*, 228.

Memory: (disc), 197; *intensity* of, 18; and *imagination*, iii.

Meniscus (capillary): *experiments* with the, 235; *instability* of the, 50.

Mental Activity: and the *Ego*, 253; (expl), 196; *production* of, 176, *repression* of, 200; and *vital units*, 200.

Mental Suggestion: 198.

Mensuration: An *anomaly* in, 10.

Meshing: An analogy of *co-ordination*, 98.

Metabolism: *neural*, 247.

Metamorphosis in *life*, 210.

Metaphysical Speculations: (ref), 238-247.

Meteorites: (ref), 123; *intense cold* of, 126, 231.

Mind and Matter: 196, 199.

Minerals and *organisms*, 219.

Minus Quantity. The, 6; 58.

Modifications of *aether*, 7, 181.

Molecular Activity: *bombardments*, 174; and *heat*, 158, (ref) 62, 68; *transmission* of *energy*, 154.

Index.

- Molecular Form** : and the X-rays, 67.
Molecules : *motion* of, 62 ; *penetrating*, 242 ; *spherical*, 62.
Moisture film, 162.
Monsoons. The, *origin* of the, 126.
Moons Orbit. The, 77.
Morality and the sexual instinct, 201.
Motion : (chapter on), 4 ; *analysed*, 8 ; *axiom* of, 10 ; *brownian*, 51 ; considered "*pure*", 85, 157, 174 ; *continuous* xv ; *dissipation* of, 218 ; and *electricity*, 60, 176 ; and *force* 71 ; and *magnetism*, 60, 176 ; *universal cause* of, 61, 144 ; *unreality* of, (another proof), 19 ; *wave*, 11.
Multiplication : *analysed*, 1 ; *origin* of, 1 ; (ref), xv.
Muscular Energy : 128.
Music as knowledge, iv.

Nature's Imitation and repetition, 217.
Nebular Theory : *Ours* 214 ; *The* 215.
Negation. *Inconceivability* of the 101.
Neptune. 124.
Nervous impulses and heat, 206.
Nervous System. The, and *cognition*, 218.
Newton and gravitation, 107, 120.
Neural Physiology, 247.
Nitrogen and life, 211.
Non-conductors : (ref), 67.
Nucleus : (mean), 100 ; see (Foci), 211.
Number : *four dimensions*, 28 ; *three dimensions*, 16 ; *The, five* 27, 31 ; the *prime*, xiv ; *The, ten*, 27 ; *The three*, xiii ; see (Triadism, xiii ;).

Objective World : *The*, 247, 251.
Occupation of space and time, 13.
Octahedron. The, (ref), 82.
Onotology : (disc), 246 ;
Opposed emanations or waves, 148.
Optical experiments, 142 ; *illusions*, 194.
Organic Elasticity, 193.
Organisms : see (architecture) (life, 187) (evolution, 217) (growth, 219).
Origin (The) : of the *halogen elements*, 211 ; of *life*, 212 ; of *matter*, 209.
Osmotic Action and life, 192.
Oxygen as a magnet, 179.

Packing or integration, 100 ; as *super-imposition*, 29.
Parent and offspring, 201.
Particles : *coherence* of, 97.
Past (The) : iii, 16 ; as *infinite*, 3.
Peltier's Effect : (ref), 191, 165.
Penetration. 79, 106.

Index.

- Pendulums**: experiments in *deep mines*, 120, 132; (ref), 132.
- Penumbra**: the *nature* of the 234.
- Perception**: of *co-extension*, 198; of an *echo*, 193; of *energy*, 129; of *heat*, 194; of *light*, 142, 194; *nature* of, 200, 247; of *sound*, 194; of *touch*, 195; *work done*, 192.
- Perfect Elasticity**, 64, 68.
- Permeability**: (ref), 33.
- Permanency of magnetism** (expl), 177.
- Periodic Law** (The): and *gravity*, 189; being incomplete, 32.
- Persistence**: (disc), vi; of *volume*, 13, 242.
- Perturbations** (astronomical): (ref), 112.
- Phases**: (chapter on), 41; of *gravity units*, 45; of *intersistence*, 224; *temporal*, 43.
- Philosophy**: the acceptance of, 255.
- Physics**: and *pressure*, 84; the *primordial* (ultimate) *unit* of, iii, 213; and *transformations of energy*, 9; the *science* of, i, 4.
- Physiological**: *Processes* (ref) 192; *units* (Herbert Spencer), 195.
- Piezo-electricity**: (ref), 178.
- Planke**: see (Quantums) 10, 43, 79, 82, 141, 222, 241.
- Planet**. *Our*, 214.
- Planets**: and *gravity*, 121, 215; *growth* of 219; *reversed revolution* of 124.
- Plants**: *growth* of 188; against *gravity*, 193.
- Pleasure and Pain**: *criterion* denied; i.
- Plenum** of *aether*, 244.
- Point** (A) of *Euclid*, 42.
- Point forces**: (ref), 38.
- Polarized Light**: 146, 152; *double*, 169.
- Polarity**: *electrical*, 55, 159; and *gravity*, 198.
- Polishing**: (ref), 79;
- Posture**: (chapter on) 27; *change* of, 34, 44; in *cohesion*, 98, 100.
- Postulates of co-extension**, ix, 10
- Potentialism**: (disc), 101, 242; (disp), 82, 101; in *electricity*, 56, 159, 160, 165; of *energy*, (disp), 139, 188, 242; of *gravity*, 103; of *heat*, 57; of *light*, 57; minus (disp), 168; of *nervous force*, 195; in *strain*, 95; and the zero, 160.
- Potentiality and motion**, 56.
- Potential-energy-concern**, 62.
- Predictions**: (chapter on) 227, of a *gas'* behaviour, 89.
- Present**. (The), iii.
- Pressure**: (chapter on) 83; and *diffusion*, 61.
- Primordial units**: and *cohesion*, 99; (ref), 205, 209, 213, 216; and *substance*, vii.
- Probabilities**: 85.
- Pulling and pushing**, 96.
- Pulsating molecules**. 242.
- Purpose**: (disc), 220; of *man*, 224, 238; in *reproduction* 254.
- Pushing Idea**: x, 107; of *electricity*, 172; of *gravity*, 111.
- Pyro-electricity**: 178.

Index.

- Quantity and consciousness**, ii.
- Quantum Theory** (Planck): (ref), 82; *weakness of*, 141, 241.
- Quantums**: of force, ix, 79; (ref), 10, 43; *repetitions*, 222; in the *kinetic molecular theory*, 84.
- Radiating Energy**: (chapter on) 141; as *heat*, 164.
- Radiations** in *equilibrium*, 162.
- Radio-activity**: *energy of*, 67; and the *gamma-rays*, 184; and *gravity*, 132; and *life*, 213; of the *sun*, 119.
- Radio-chemistry**: The *work in*, 235.
- Realism**. 250.
- Reality**. The *modern idea of the*, 43.
- Re-appearances**: *Loci of*, 44.
- Reason**. The, 200.
- Reciprocal Intersistence**: and the *Design*, 221; and *electric units*, 170; and *heat formation*, 174; (ref), 99, 174, 218.
- Rectilinear Forms**: *conversion of*, 29; *dissection of*, 81; of *energy*, 46; or *figures*, 22; the *nature of*, 26; *necessity of*, vii;
- Reflection of light**: 144, 145.
- Reflector** (metallic): 151.
- Reflex action**, 252.
- Refraction**: considered, 150; *amplitude of light and*, 149.
- Refracted Light**, 155.
- Relativity**: (ref), 5, 6, 24, 41, 46, 72, 78, 125, 239, 241; and *variable mass*, 92; *space-time*, 20; *velocity as criterion*, 5.
- Religion**. 225.
- Remarks** (Concluding), 236.
- Repetition in Nature**, 81, 217, 222, 242; see (*Imitation*).
- Reproduction and chemical union** compared, 225; and *growth*, 225.
- Repulsion**: *electrical*, 58, (expl.) 167; not recognised, 55.
- Responsive Power of Life**. iii, 157.
- Residual electrical charges**, 162.
- Rest**. The *manifestation of*, 117.
- Restitution** (Force of): and *gravity*, 104.
- Reversed action**: significance of, 101.
- Reynold's shot experiment**, 97.
- Rope** (A) in relation to *tension*, 96.
- Rotation**: *energy of*, 76; and *gravity*, 231.
- Rotational polarization**, 153.
- Rutherford** (ref), 131.
- Sap**: *rise of*, 193.
- Satellite**: *deflection of*, 112.
- Saturn in the Nebular Theory**, 215.
- Science**: acceptance of, 255; of *Biology*, 4; of *Chemistry*, 4; a *failure in*, 223; the *goal of*, i; of *Physics*, 4; what is *not a*, 62; under *Relativity*, 241.
- Sciences**: The, i.
- Scientific convention**, 48, 241.
- Sea-sickness**. 232.

Index.

- Seals.** Newly born (*growth*), 210.
Segregation of particles, 98.
Self-consciousness, (expl), 199.
Sex : (ref), xv.
Sexuality and intelligence, 201, 224.
Shadow : the *Black Drop*, 234; the *nature of a*, 10.
Simplicity : *expected*, ii, 130; *scientific sanction of*, 205.
Sky : colour of the, 119, 229.
Soap-bubbles (disc), 52.
Softness, (expl), 106; (ref), 88.
Solar energy : *origin of*, 135.
Solar System : *genesis of the*, 123; as a *whirlpool*, 124.
Solidity : *molecular*, 33, 53; and *pressure*, 103; (ref), 88; and *temperature*, 63.
Solids : *transfusion of*, 10, 102.
Solution : as *disintegration*, 101; of salts under *heat*, 86, 232.
Soul : *allocation of the*, 237.
Sound : (disc), 103; *energy of*, 143; *abnormal energy of* 185; and *gravity*, 186; *intensity of*, 185; *perception of*, 194; *velocity of intense*, 152.
Spacial matter : *additions of*, 77; described, 19; (mean), 13; *unit of*, 71.
Space : (chapter referring to), 14; *deformed*, 5; *one dimensional* (disp), 19; *infinite*, 6; as *occupied*, 6, 13; in the *Reality*, 184.
Space-time : how arrived at, 21; *equation of*, 23; (ref), 10.
Specific Heat and gravity, 137, 230; and *radio-activity*, 229.
Spectrum (The) : *abnormal*, 154; *production of*, 154; (ref), 32, 156.
Sphere : of *co-ordination*, 33, 36, 97; *nature of a*, 2, 19.
Spherical Molecule, 61.
Spheroidal State, 50.
Spirit (The) : the *nature of*, 199; and the *Universe*, 203.
Spontaneous Generation : and *biology*, 225; (mean), 209; (ref), 188.
Spontaneous motion in gases. 92.
Square : in a circle, xiv; *nature of*, 25.
Stars (shooting) as *extraneous matter*, 128.
Statics : as *knowledge*, iv (ref), 80.
Strain : (disc), 95; and *heat*, 103; and *magnetism*, 178.
Sub-consciousness : (disp), 201.
Subjective World. The, 247, 255.
Sublimation, 63.
Substance : (chapter referring to), 14; (def), vi; the *nature of*, v; *spatial form of*, 43; *temporal form of*, 43.
Subtraction : 2; see (*annihilation*, iv, 14, 42, 127,) and *finiteness*, 42;
Suggestion (mental), 198.
Sun : *energy of the*, 108; *heat of the*, 155; *spots of the*, 119.
Surface Tension : and *contact*, 53; (disc), 49; and *equilibrium*, 50; and *heat*, 52; the *negative*, 53.
Surveying : (ref), 234.
Swinging : (ref), 232.
System : *co-ordination as a*, 98; the *idea of a*, 35; of *light-units*, 146; or *compound unit*, 35.

Index.

- Telepathy**, 202.
- Temporal matter** : described, 19; of *intersistence*, 38.
- Temporal Quantity of substance**, 20.
- Temperature** (absolute) : 63; and *gravity*, 231.
- Tension** : (disc), 51, 96.
- Tetrahedron**. The, 32.
- Theory** : the *aether*, (disp), 142; the, of *capillarity*, 98; *Chatelier and Braun's* enunciation, 189; the, discussed, 236; the *electro-magnetical*, 7, 73, 76, 176; the *electronic*, 54; the *emission*, x, 184; the *genesis* of our, 239; the *ionisation*, 59, 69, 171; the *kinetic molecular*, 39, 50, 53, 102, 179; *Laplace's* (capillarity), 49; our *nebular*, 214; of *quantums* 52, 141, 141; the, of the *solar system*, 120, 123.
- Theories** (modern) : (chapter on) the, 48; and the *obvious*, 61.
- Thermal effusion**, 65.
- Thought** : and the *Eyes*, 199; the *feeling* in, 192; and *gravity*, 195; the *nature* of, 253; *quantums*, 248; *transference* of, 208.
- Thought-reading** : the *nature* of, 202.
- Tides**. The, (ref), 126.
- Time** : (disc), 14; (described), 16; *one dimensional*, 19; *occupation* of 18; and *Space*, 2.
- Time-space**. 24; see (*space-time* and *time-volume*.)
- Time-volume** : 23, 43, 46, 224.
- Top** : *instability* of a, 44.
- Touch** : and the "boundless" *finitum*, 15; the *sense* of, 198.
- Tourmaline** : and *electricity* (ref), 138.
- Transformation** : adumbrated, 46; of *energy* and *electricity*, 57; *modern idea* of, ix; in *physics*, 9, 242.
- Transfusion** : as *permeability*, 38; of *solids*, 10, 102, 106.
- Transmission** : of *disturbances*, 99; of *insistence*, 81; of *light*, 144; of *sound*, 148.
- Transmutations of elements**, 28.
- Transparency**, 153.
- Triadism** : (chapter on) xiii; *absence* of 134; of, *circular contents*, 25; of the *three co-ordinates*, 16, 38; and the *three Egoes*, 252; in *extension*, 42; *numerical* 30; in *rectilinear figures*, 26; of *super-imposed spheres*, 96; and the *philosophical trinity*, 246; (ref), 16, 25, 134; of the *triangle*, 25; in the *Ultra-reality*, 255.
- Trinity** : the *philosophical*, 246.
- Truncation** in the *rectilinear figures*, 29.
- Truth**, 244.
- Tubes of energy** (disp), 181.
- Tuning fork** : *energy* and a, 104.
- Turbulency** : *electrical*, 170, 172; position of *electrical*, 161.
- Ultra-reality** : acceptance of, 246, 255; (expl) 14; the *trinity* of the, v.
- Ultra-violet rays**, 68.
- Unconditioned**. The, 246, and the *Ego*, 252.
- Unexpected**. The, 48.
- Unit** : *Compound*, 35; and *co-ordination*, 79; the *electrical*, 179; the *indivisibility* of a, 112; *locus* of a, 122; of *magnetism*, 179; the

Index.

- nature of a*, 48; *primordial unit*, 205, 209, 213, 216; the, of *Space*, 221; the *spacial*, 71; The, (disc) v, of *time*, 221; the *ultimate*, (see *primordial*).
- Units.** The *three*, 133.
- Uniformity of changes:** (ref), x, 222.
- Universe:** the *trinity* of the, iii; the, and the *ultra-reality*, 205.
- Uranus.** 124.
- Utility** The *nature of*, 204, 254.
- Vacuum:** (mean), v.
- Vegetable growth**, 207.
- Velocity.** A *characteristic of*, 18, 207.
- Venus:** the *black drop* in the transit of, 234.
- Vibrations** (discontinuous motion): *atomic*, 61; continued, xv; and *heat*, 61; and *gravity*, 231; and *light*, 146; the *nature of*, 103.
- Viscosity:** (ref) 89; and *mobile molecules*, 33.
- Vital Forces:** *activity of* the, 78; and *radio-activity*, 213; *recognition of* the, 23.
- Vital Units:** assumption of, 193; and *Consciousness*, 252; (disc), 196; *emanations of*, 198; and *mental activity*, 200; *number in the Universe*, 226; and *thought*, 252.
- Vivid Impressions**, 252.
- Volcanoes** and *energy*, 108.
- Volition:** the *nature of*, 191, 204.
- Volume:** *constancy of unit-*, 28; (disc), vi; and *persistence*, 13, 23; see (*space-time*); of a *system and gravity*, 115.
- Wave-motion:** (ref), 11; *energy of*, 104, 185.
- Waves.** (Hertzian), 148.
- Weight:** (chapter on) 83; of the *chemists*, 245; of a *gas*, 86, 88; the *nature of*, 115.
- Weismann** and *heredity*, 217.
- Will:** (expl), 190; and the *desires*, 204; and *Insistance*, ix; (ref), 187; in *sustenance*, 190; in *thought*.
- Wind:** recognition of a, 130.
- Work Done:** an analysis of, 77; (def), viii; (disc), 74, 78; of *electrical charging*, 56; in *induction*, 183; the *modern view of*, 177; *perception of*, 192; in *sound transmission*, 104.
- Wheel and axle** compared to *Consciousness*, 248.
- X-rays:** as *emissions*, 184; *molecular rule of*, 67, 153.
- Zero:** (disc), 8; in *electrical potential*, 59, 160; in *mathematics*, 6; as a *point*, 42; and the *inconceivable small*, 238; and a *Value*, 70
- Zinc**, the *cohesion in*, 95.

